The Working Group to Study Nonalcoholic Fatty Liver Disease, Including Nonalcoholic Fatty Liver and Nonalcoholic Steatohepatitis

Final Report
to the Public Health Committee
of the Connecticut General Assembly

Pursuant to Public Act 24-19 (Section. 8)

January 1st, 2025

Report of the Connecticut State Working Group on Metabolic Dysfunction-Associated Steatotic Liver Diseases (previously Non-alcoholic Fatty Liver Disease)

The healthy liver has a myriad of functions which include converting dietary nutrients into usable molecules, producing vital proteins such as blood clotting factors and removing toxins from our body. Metabolic dysfunction-associated steatotic liver disease (MASLD) is a condition that afflicts between 30-40% of the population of Connecticut (CT) and is characterized by excess accumulation of fat inside liver cells. This produces stress on these cells, and results in their loss of normal function, and eventually death of a portion of these cells. The more damaging form which affects approximately 25% of patients with MASLD is termed metabolic dysfunction-associated steatohepatitis (MASH). MASLD and its subgroup MASH are chronic diseases where patients have excess fat and liver cell death over years, yet are without symptoms. The liver fortunately has a great ability to replace dying cells, however it does not do so perfectly, and the repaired liver tissue is left with varying degrees of scar. If this process of chronic injury and repair is allowed to continue for years, the entire liver develops increasing levels of scarring, termed fibrosis. The gradual progression of fibrosis in the liver results in the development of end-stage liver disease termed cirrhosis.

Data on the national epidemiology of MASLD/MASH is alarming due to the rapid increase in the prevalence of MASDL/MASH. It is also alarming because the data are based on formal diagnosis and coding and a significant proportion of individuals with the disease go undiagnosed and are not identified by this approach. Even with the imperfect data sets, the prevalence of MASLD/MASH has been increasing nationally (1). MASH was responsible for approximately 31% of all liver transplants performed in the USA in 2022, and this is an increase from 10% in 2013 (2). A closer examination of the data reveals an additional alarming trend that the greatest increase in the incidence of MASH is occurring in relatively younger adults in the 18-39 year range as compared to those 40 year olds and above. This concerning data in young adults is mirrored in the pediatric population where approximately 35% of children in the USA have MASLD, and approximately 15% have significant liver fibrosis (3). The high prevalence of MASH and the consequences of liver cirrhosis has resulted in MASH being the major cause of morbidity and mortality from end-stage liver disease and the development of liver cancer.

The factors driving MASLD/MASH are closely related to the factors driving the other metabolic syndrome-related diseases, such as obesity and diabetes mellitus type 2. The key drivers are environment and lifestyle-related, with over nutrition (particularly for carbohydrates and sugars) and sedentary lifestyle being the major ones (4). Other factors such as sleep deprivation and psychological stress likely also play a role (5). Many of these factors are themselves accentuated by inner city conditions such as easy access to cheap highly processed foods, with fresh nutritional foods being less easily available and more expensive. Opportunities to exercise are also more limited for inner city residents often due to multiple jobs, longer working hours and night-shift work. The effects of a poor life style can result in metabolic diseases such as diabetes and MASH even in individuals not prone to weight gain and approximately 20% of MASH patients are not overweight or obese.

The above nutritional and other lifestyle factors interact with genetic predispositions for the development of MASLD/MASH (6). These genetic associations have several important clinical consequences. All groups have seen a steep rise in the incidence of MASH, but individuals of

Hispanic heritage have a genetic profile which makes it much more likely that they will develop MASH than those with Caucasian heritage. Also, for an individual with MASH, there is a 12 times higher risk that family members will have advanced diseases due to a concentration of genetic and environmental factors. These genetic factors make MASH a disease that is particularly dangerous for individuals of Hispanic heritage.

Please see appendices A and B for further information and graphics.

The working group was asked to address the following nine topics which have been grouped into related areas.

A) POPULATION DATA

(1) The incidences of such disease in the state compared to incidences of such disease throughout the United States. This is addressed by recommendations 3, 4, 7 below.

(2) The population groups most affected by and at risk of being diagnosed with such disease and the main risk factors contributing to its prevalence in such groups. This is addressed by recommendations 3, 4, 7 below

B) POLICY AND OTHER INTERVENTIONS TO REDUCE DISEASE BURDEN

(3) Strategies for preventing such disease in high-risk populations and how such strategies can be implemented state-wide. This is addressed by recommendations 1, 3, 4, 6, 7 below

(4) Policy changes necessary to improve care and outcomes for patients with such disease This is addressed by recommendations 1, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18 below

(5) The manner in which social determinants of health influence the risk and outcomes of such disease and interventions needed to address such determinants. This is addressed by recommendations 8, 15, 17, 19, 20 below

C) CREATING STRUCTURES TO INCREASE AWARENESS AND DETECTION

(6) Methods of increasing public awareness of such disease, including, but not limited to, public awareness campaigns educating the public regarding liver health This is addressed by recommendations 1, 2, 7, 8 below

(7) Whether implementation of a state-wide screening program for such disease in at-risk populations is recommended. This is addressed by recommendations 3, 5, 6, 7 below.

(8) The creation of patient advocacy and support networks to assist persons living with such disease. This is addressed by recommendation 1 below

D) TREATMENT

(9) Insurance coverage and affordability issues that affect access to treatments for such disease. This is addressed by recommendations 20 below.

In response to these nine prompts the working group has the following recommendations:

1. Designate a day as "CT Liver Healthy Day" and advertise it using state apparatuses. This will create an opportunity for key stake holders such major state health networks, charities, organizations such as the American Liver Foundation, and individuals to focus on liver health. It also create an opportunity for educational activities at various levels, including teachers who could utilize educational materials for MASLD for student instruction, and news outlets for increasing public awareness about MASLD. Furthermore, patient advocacy organizations can leverage this day to achieve their goals. We recommend that the timing is coordinated with national organizations such as the American Liver Foundation.

2. Identify resources for CT Liver Health Day, including radio and on-line ads. Some of such resources are already available from the American Liver Foundation (see appendices A and B). In addition, we recommend that the state support the proposed CT Liver Health Day through the deployment of any available resources, for instance through a memo sent by the State to Healthcare providers in commemoration of the Day.

3. Establish a system for screening electronic medical records in the state of CT to identify individuals, and groups of individuals at high risk of MASH.

a) Examples of individuals at risk for MASLD are those with one or more of these features:

i) BMI above 27

ii) Features of metabolic syndrome, including:

iii) Abdominal obesity: A large waistline, which is 40 inches or more for men and 35 inches or more for women

iv) High blood pressure: A blood pressure of 130/80 or higher

v) High blood sugar: A fasting blood sugar level of 100 mg/dL or higher

vi) High triglycerides: A triglyceride level of 150 mg/dL or higher

vii) Low HDL cholesterol: An HDL cholesterol level that's less than 40 mg/dL for men and less than 50 mg/dL for women

viii) Hispanic heritage

ix) Obstructive sleep apnea

x) High sugar intake

4. Reach out to key individuals in health care systems. We recommend that the State engage key individuals or entities in healthcare systems, such as the office of public health, to facilitate statewide screening of electronic medical records. Records screened would include those of all health care centers in the state including federally qualified health centers.

5. Reach out to key funding organizations. These will include but are not limited to the following:

Patient Centered Outcomes Research Institute (PCORI)

https://www.pcori.org/funding-opportunities/what-who-we-fund/research-project-agenda-topic-themes-inform-focused-funding-opportunities/2025-research-project-agenda-topic-themes

National Institute of Digestive Diseases and Kidney (NIDDK)

https://www.niddk.nih.gov/research-funding/current-opportunities

National Institute of Alcohol Abuse and Alcoholism (NIAAA)

https://www.niaaa.nih.gov/grants-funding/funding-opportunities

6. Propose a goal of prospective screening using transient elastography for liver fibrosis in high-risk areas. These will be predominantly areas with low access to healthy foods and high Hispanic populations.

7. Initiate screening using transient elastography for liver fibrosis in high-risk areas. This could be achieved with one machine and two staff who would travel to primary care clinics and health centers and offer free liver fibrosis screening. An extension of this will be to apply precision medicine to better target therapies.

8. Develop a broad outreach program. This will educate three key groups about liver health: primary care providers (including pediatricians) and community health workers; teachers, school health nurses and meal vendors; and middle and high school students. Outreach may be undertaken with radio ads, easy to access teaching materials and direct outreach programs.

Key points to get across:

A) MASLD can result in cirrhosis and death.

B) MASLD is associated with obesity and most patients have mild, not severe obesity.

C) Individuals of Hispanic descent are at especially high risk of MASLD and cirrhosis.

D) There are effective ways to manage MASLD.

E) Lifestyle choices (such as sugary drinks) play a major role in the development of MASLD.

https://www.gastrojournal.org/article/S0016-5085(20)35538-4/fulltext

Please see appendix A (MASLD Overview) and B (Teens to Twenties Liver Wellness).

F) Moderate alcohol intake along with a high BMI increases the likelihood and severity of MASLD.

G) Social determinants of health

https://www.cdc.gov/about/priorities/why-is-addressing-sdoh-important.html

H) Identify food deserts, and within this topic address issues of food accessibility, food insecurity, and cultural beliefs.

https://www.ers.usda.gov/data-products/food-access-research-atlas/documentation/

https://ctmirror.org/2023/06/09/ct-food-deserts-census-grocery-stores-low-income/

9. Work directly with Community health workers to implement outreach goals. This can be achieved by using the Community Health Workers Association of CT as a resource (https://www.cpha.info/page/CHWACT/Community-Health-Workers-Association-of-CT.htm).

10. Implement the 5-2-1-0 Let's Go! Campaign. This campaign was launched by the United Way of Greater Portland in response to the growing concern regarding the health and economic impacts of childhood obesity in the state of Maine. It was initially a project in some municipalities in Maine, but quickly spread to many parts of the state. The campaign emphasizes:

5 or more fruits and vegetables a day

2 hours or less of screen time (TV, computer, smart phones, video games, or tablets) daily

1 hour or more of physical activity daily

0 sweet drinks

(https://www.mainehealth.org/lets-go/about).

11. Engage the CDC model of Whole School, Whole Community, Whole Child (https://www.cdc.gov/whole-school-community-child/about/index.html) to increase awareness and initiate health changes related to chronic liver disease.

12. Include chronic liver disease in State Health Dashboard (https://stateofhealth.ct.gov/HCT2020/HCT2020Index). The current prevalence of chronic liver disease (at least 10% of the CT population) and the clear trajectory of further increase makes it justifiable to include chronic liver disease in this important dashboard. Furthermore, chronic liver disease (unlike heart disease and stroke) is an area that is under appreciated by the public and significant benefits can be achieved by modest investments in population education.

13. Engage State Health Improvement Plan (SHIP) to develop outreach into communities. This could begin with having a liver expert on the SHIP advisory council to contribute to assistance and planning (https://portal.ct.gov/dph/state-health-planning/healthy-connecticut/healthy-connecticut-2025).

14. Engage with Nonprofit hospital health needs assessments (CHNAs). Provide input into their implementation strategy which is revised every three years (https://www.aha.org/topics/community-health-needs-assessments-chnas).

15. Address the negative impact of maternal MASLD on the risk of MASLD in their children. Propose engaging the Women, Infants, and Children (WIC) Works Resource Program to address the high rates and disparities in childhood MASLD (https://wicworks.fns.usda.gov/resources/healthy- start)

16. Highlight the specific risk of fructose in the development of MASH. Identify the top five point of fructose delivery to CT residents. Highlight the liver risk of fructose consumption in educational materials (see appendix C Fructose and MASLD).

17. Highlight pediatric MASH as a public health problem. This can be achieved through many of the outreach programs in the other recommendations.

18. Communicate with soft drinks providers. Confirm with them that there is a state level recognition of the risk of the sugars in soft drinks and the development of MASH.

19. Identify partners in Hispanic communities to reduce the impact of MASLD. This can be via community centers, churches etc, where the dangers of MASH can be highlighted. The Hispanic Health council can be an important partner in this (https://hispanichealthcouncil.org/).

20. Mitigate affordability in setting up an active liver fibrosis screening program. This would be concomitant with recommendation for a prospective screening program. Such screening could take place in several places such as primary care offices and school-based health centers (https://portal.ct.gov/dph/family-health/school-based-health-centers/school-based-health-centers).

Summary

Metabolic dysfunction-associated steatotic liver disease (MASLD) and its more severe subtype metabolic associated steatotic hepatitis (MASH) are prevalent chronic liver diseases in the CT population and are the major causes of liver cirrhosis, liver cancer and liver related deaths. The working group has formulated twenty recommendations and among them, the designation of a CT Liver Health Day (#1), developing a broad outreach program (#8) and establishing screening of the electronic medical record system (#3) are seen as having a good balance of high impact as well as being implemented with minimal resources. Recommendation of a prospective liver fibrosis screening program (#6, 7 and 20) will generate new information, have high impact but would require significant resources to initiate and moderate resources to maintain.

Full implementation of the above recommendations will require further analysis and planning.

The report has the following appendices:

Appendix A: MASLD Overview

Appendix B: Teens to Twenties Liver Wellness

Appendix C: Fructose and MASLD

Appendix D: List of working group members

References:

1 Miao, L., Targher, G., Byrne, C. D., Cao, Y. Y. & Zheng, M. H. Current status and future trends of the global burden of MASLD. Trends Endocrinol Metab **35**, 697-707 (2024). https://doi.org:10.1016/j.tem.2024.02.007

2 Younossi, Z. M. et al. The changing epidemiology of adult liver transplantation in the United States in 2013-2022: The dominance of metabolic dysfunction-associated steatotic liver disease and alcohol-associated liver disease. Hepatol Commun **8** (2024). https://doi.org:10.1097/HC9.0000000000000352

3 Stroes, A. R., Vos, M., Benninga, M. A. & Koot, B. G. P. Pediatric MASLD: current understanding and practical approach. Eur J Pediatr **184**, 29 (2024). https://doi.org:10.1007/s00431-024-05848-1

4 Hepburn, C. & von Roenn, N. Nutrition in Liver Disease - A Review. Curr Gastroenterol Rep **25**, 242-249 (2023). https://doi.org:10.1007/s11894-023-00887-4

5 Schaeffer, S. et al. Significant nocturnal wakefulness after sleep onset in metabolic dysfunction-associated steatotic liver disease. Front Netw Physiol **4**, 1458665 (2024). https://doi.org:10.3389/fnetp.2024.1458665

6 Meroni, M., Longo, M., Tria, G. & Dongiovanni, P. Genetics Is of the Essence to Face NAFLD. Biomedicines **9** (2021). https://doi.org:10.3390/biomedicines9101359

Appendix A

AMERICAN LIVER FOUNDATION®

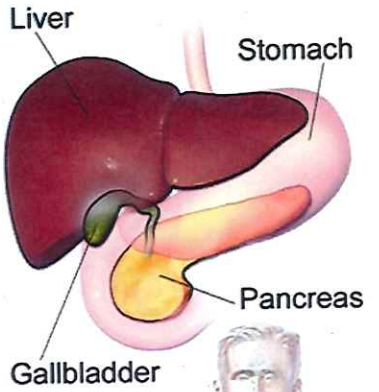
STEATOTIC LIVER DISEASE

Metabolic dysfunction-associated steatotic liver disease (MASLD) & metabolic dysfunction-associated steatohepatitis (MASH)

Helpful Terminology

MASLD	Metabolic dysfunction-associated steatotic liver disease (MASLD)
MASH	Metabolic dysfunction-associated steatohepatitis (MASH)
Fibrosis	• Scarring of the liver • Scar tissue replaces healthy, functioning liver cells • Severity of scarring graded with a number 0 (no scarring) to 4 (cirrhosis)
Cirrhosis	• Severe scarring of the entire liver • Last stage of fibrosis • Liver no longer functions well because too much healthy tissue is replaced by scar tissue
Hepatocellular Carcinoma (HCC)	• Primary liver cancer • Most often occurs in people with cirrhosis and underlying liver disease • Liver cancer rates in the United States continue to rise

About the Liver

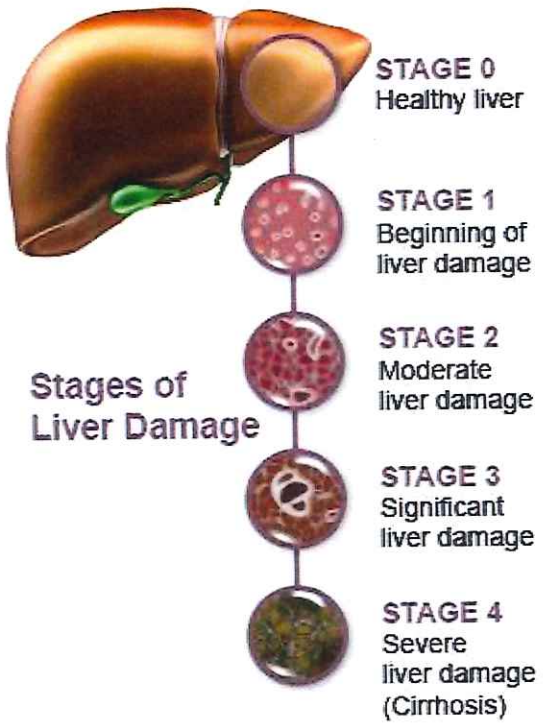


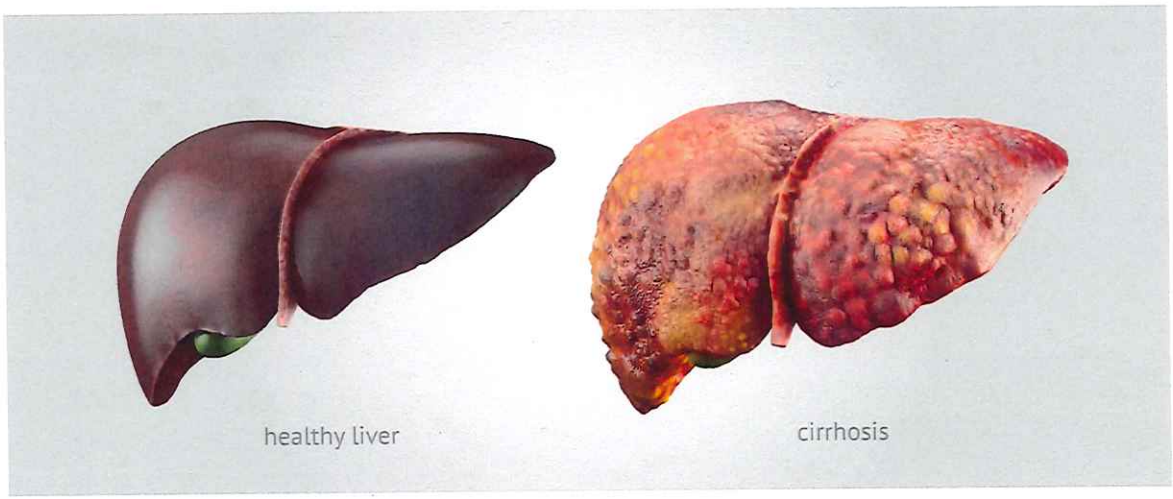
Gallbladder, Liver, and Pancreas

Your Liver...

- Acts like a filter by processing everything we eat, drink, breathe and absorb through our skin.
- Helps build muscle
- Makes bile to digest food
- Stops cuts from bleeding
- Kills germs
- Detoxifies harmful substances in your body

Progression of Liver Disease





What is metabolic dysfunction-associated steatotic liver disease (MASLD)?

MASLD is the build up of extra fat in liver cells.

MASLD is found in 75% of people who are overweight and in 90% of those with severe obesity.

MASLD occurs when more than 5% of the liver is fat.

People with MASLD usually have no symptoms until later stages of the disease.

MASLD can occur in individuals with predisposing metabolic risk, with or without alcohol use.

Although usually associated with obesity, MASLD can occur in people with a normal BMI.

MASLD may lead to cirrhosis.

MASLD is reversible if detected early.

What is metabolic dysfunction-associated steatohepatitis (MASH)?

Nearly **25%** of people with MASLD will progress to MASH.

MASH is the more severe form of MASLD.

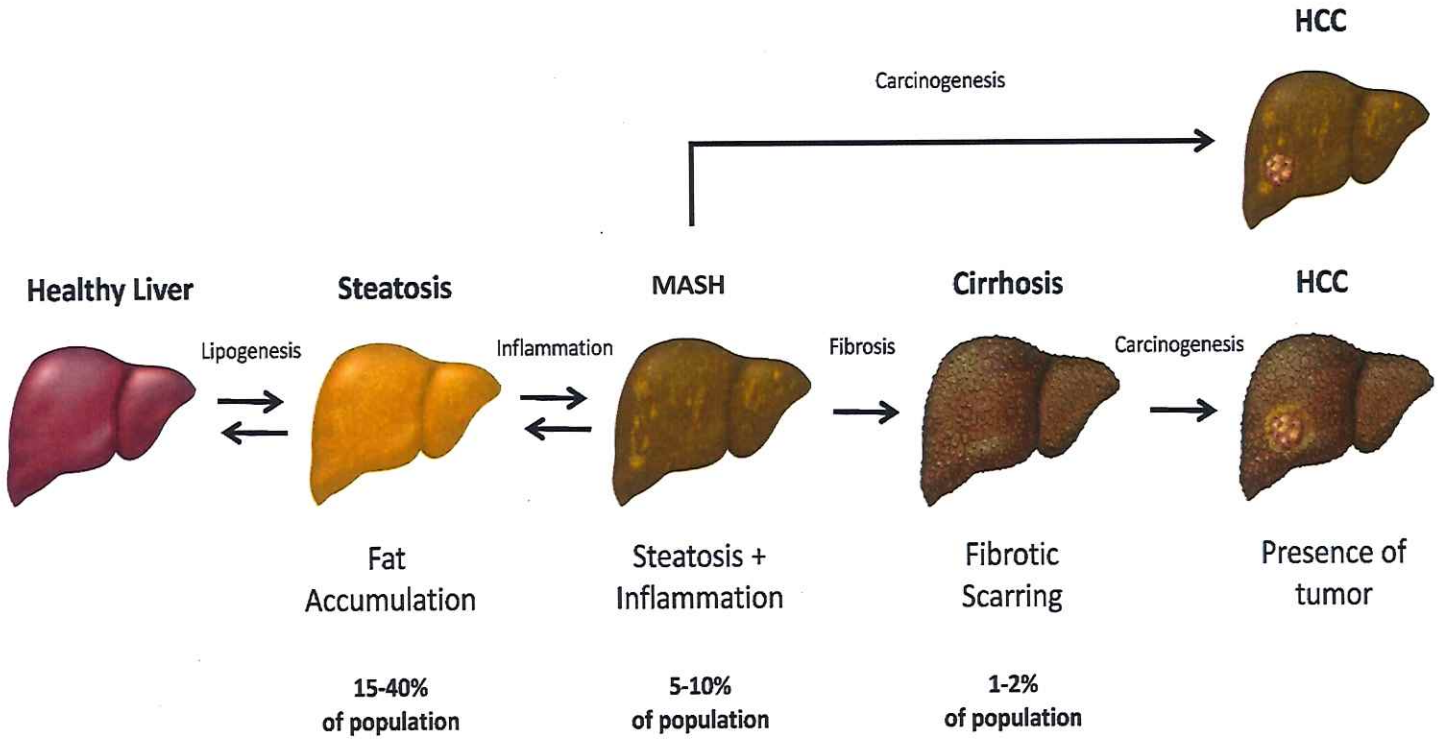
People with MASH have fat deposits in the liver causing inflammation (hepatitis) which can cause liver cell damage and fibrosis.

MASH may lead to cirrhosis and liver cancer.

MASH is one of the leading causes for liver transplantation in the U.S.

There is a new treatment option for MASH patients who have progressed to fibrosis.

Progression of MASLD/MASH



MASLD/MASH: A Silent Epidemic

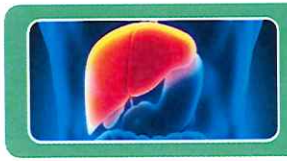
Most people with MASLD have no signs or symptoms in early stages of the disease. If symptoms do occur, they may include:

- Abdominal pain
- Fatigue and weakness
- Itching
- Loss of appetite
- Nausea

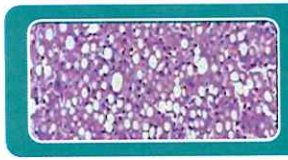
People with more advanced disease, like MASH and cirrhosis, may experience the following symptoms:

- Intense itching
- Fluid filled belly (ascites)
- Bruising and bleeding easily
- Yellowing of the skin and eyes (jaundice)
- Spider-like blood vessels just beneath skin's surface
- Behavior changes, slurred speech, and confusion (hepatic encephalopathy)

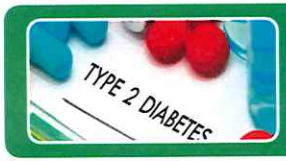
Did you know?



MASLD is the most common forms of liver disease in the U.S.



Research estimates that MASLD is present in up to **75% of people who are overweight** and **90% of those considered obese.** . Nearly **25% of people** with MASLD will progress to MASH.



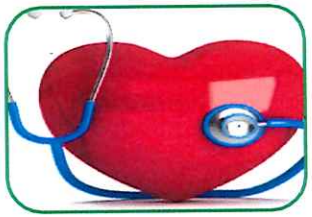
You may be at risk for MASLD/MASH if you are overweight, have type 2 diabetes, high cholesterol, high triglycerides, are female or between 40-60 years old.

MASLD is the **most common form of pediatric liver disease**. Researchers estimate as many as 10% of U.S. children ages two to 19 have MASLD.

MASLD Risk Factors

Being overweight or obese

Type II Diabetes



Heart Disease

Hypertension

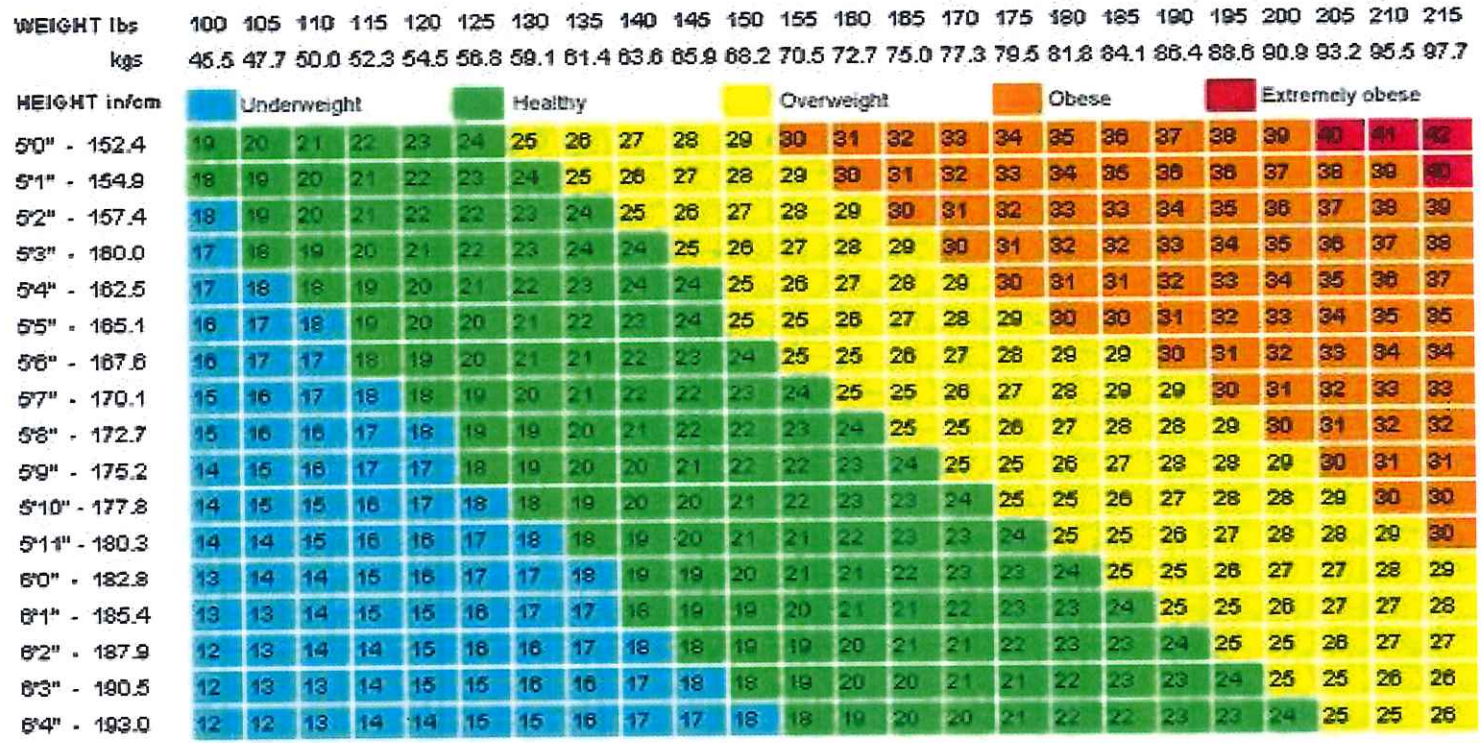
High Cholesterol/
High Triglycerides

Certain Drugs

Body Mass Index (BMI)

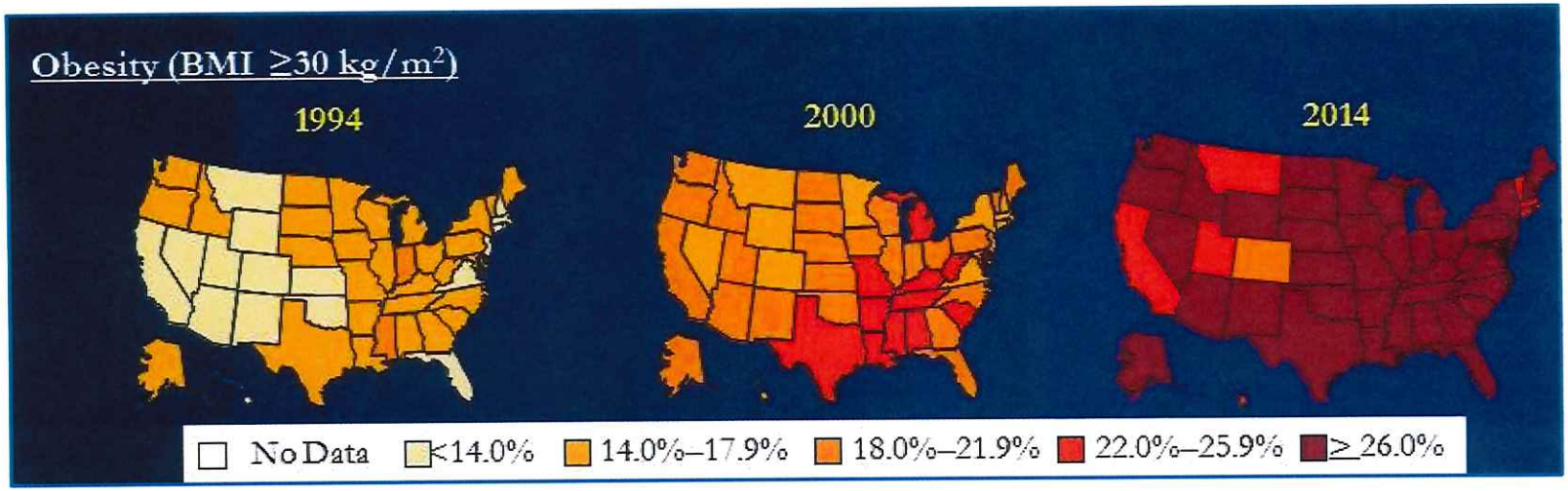
- BMI is one way to determine if someone is obese.
- BMI does not reflect body composition (muscle vs. fat).
- Visceral fat actively increases the risk for many health problems which is why it is referred to as "active fat."
- Visceral fat builds up in the abdominal cavity, around vital organs like the liver.
- Visceral fat may be better assessed with waist circumference.
- Lean people may still develop MASLD/MASH

Calculating BMI



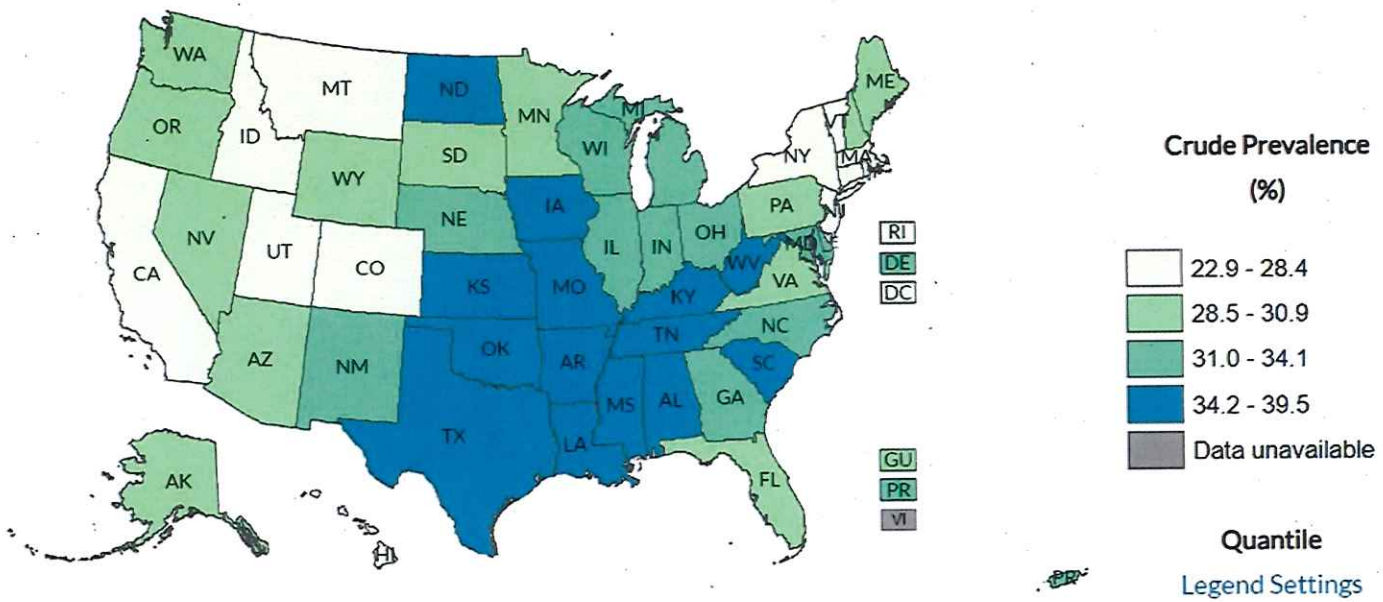
WEIGHT lbs	100	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215
kgs	45.5	47.7	50.0	52.3	54.5	56.8	59.1	61.4	63.6	65.9	68.2	70.5	72.7	75.0	77.3	79.5	81.8	84.1	86.4	88.6	90.9	93.2	95.5	97.7
HEIGHT in/cm	Underweight					Healthy					Overweight					Obese				Extremely obese				
5'0" - 152.4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
5'1" - 154.9	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	36	37	38	39	40
5'2" - 157.4	18	19	20	21	22	22	23	24	25	26	27	28	29	30	31	32	33	33	34	35	36	37	38	39
5'3" - 160.0	17	18	19	20	21	22	23	24	24	25	26	27	28	29	30	31	32	32	33	34	35	36	37	38
5'4" - 162.5	17	18	18	19	20	21	22	23	24	24	25	26	27	28	29	30	31	31	32	33	34	35	36	37
5'5" - 165.1	16	17	18	19	20	20	21	22	23	24	25	25	26	27	28	29	30	30	31	32	33	34	35	35
5'6" - 167.6	16	17	17	18	19	20	21	21	22	23	24	25	25	26	27	28	29	29	30	31	32	33	34	34
5'7" - 170.1	15	16	17	18	18	19	20	21	22	22	23	24	25	25	26	27	28	29	29	30	31	32	33	33
5'8" - 172.7	15	16	16	17	18	19	19	20	21	22	22	23	24	25	25	26	27	28	28	29	30	31	32	32
5'9" - 175.2	14	15	16	17	17	18	19	20	20	21	22	22	23	24	25	25	26	27	28	28	29	30	31	31
5'10" - 177.8	14	15	15	16	17	18	18	19	20	20	21	22	23	23	24	25	25	26	27	28	28	29	30	30
5'11" - 180.3	14	14	15	16	16	17	18	18	19	20	21	21	22	23	23	24	25	25	26	27	28	28	29	30
6'0" - 182.8	13	14	14	15	16	17	17	18	19	19	20	21	21	22	23	23	24	25	25	26	27	27	28	29
6'1" - 185.4	13	13	14	15	15	16	17	17	18	19	19	20	21	21	22	23	23	24	25	25	26	27	27	28
6'2" - 187.9	12	13	14	14	15	16	16	17	18	18	19	19	20	21	21	22	23	23	24	25	25	26	27	27
6'3" - 190.5	12	13	13	14	15	15	16	16	17	18	18	19	20	20	21	21	22	23	23	24	25	25	26	26
6'4" - 193.0	12	12	13	14	14	15	15	16	17	17	18	18	19	20	20	21	22	22	23	23	24	25	25	26

Obesity Trends is U.S. Adults



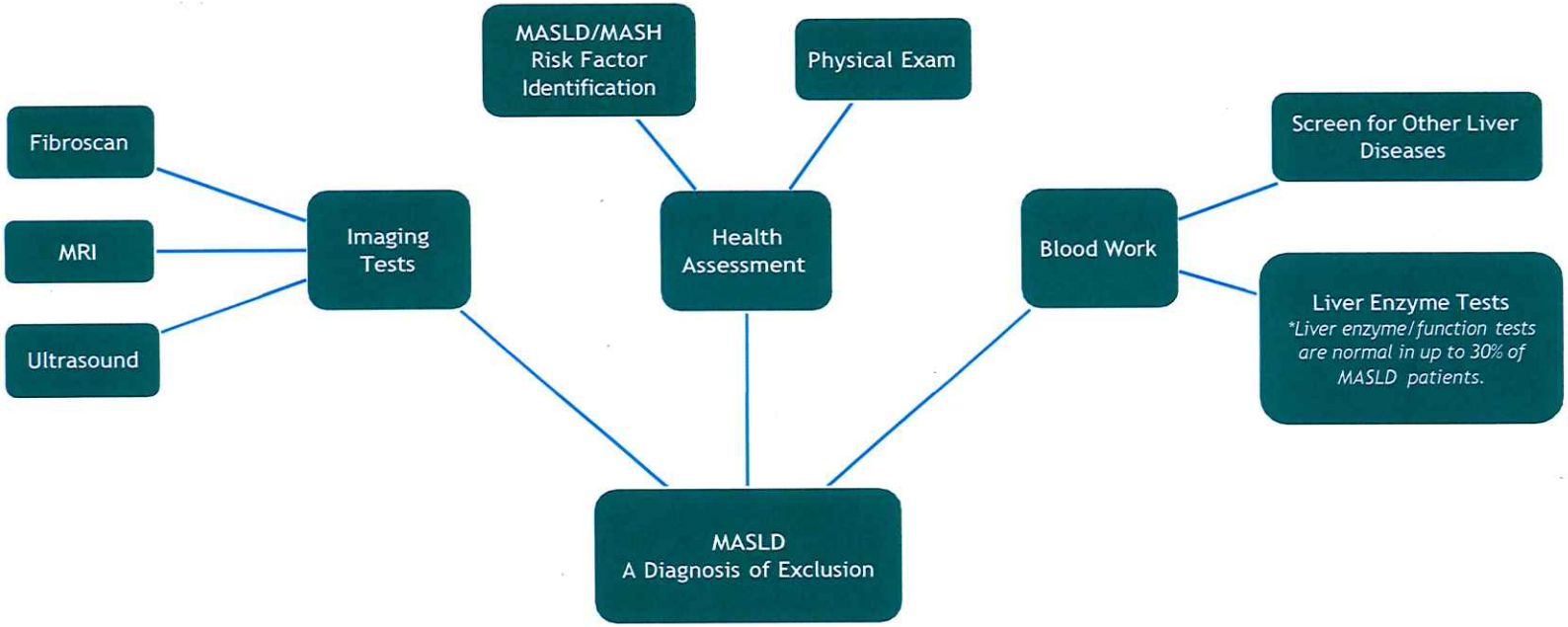
The data shown in these maps were collected through CDC's Behavioral Risk Factor Surveillance System: **1994, 2000, and 2014**

Obesity Trends is U.S. Adults



The data shown in these maps were collected through CDC's Behavioral Risk Factor Surveillance System: **2018.**

Diagnosing MASLD/MASH



Treatment for MASLD

Mind your Medications

Take medications only as instructed and share with your doctor all medications you are currently taking, including supplements

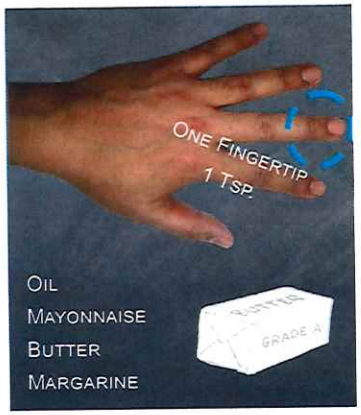
Lifestyle Changes

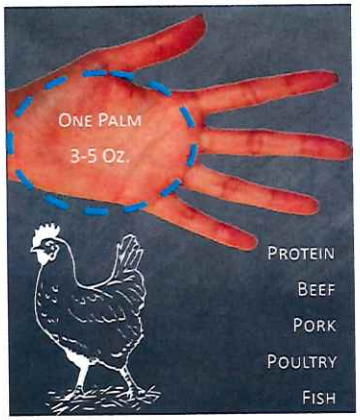
Nutrition and exercise are two areas you may need to modify to treat fatty liver. Talk to your doctor or a nutritionist about what type of diet and exercise plan is right for you.

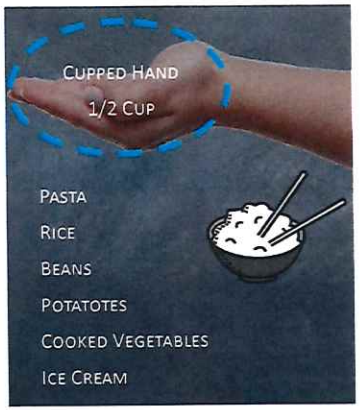
Alcohol Elimination

Alcohol can cause a liver to become fatty. People with any sort of fatty liver disease should avoid alcohol as it can make liver disease worse.

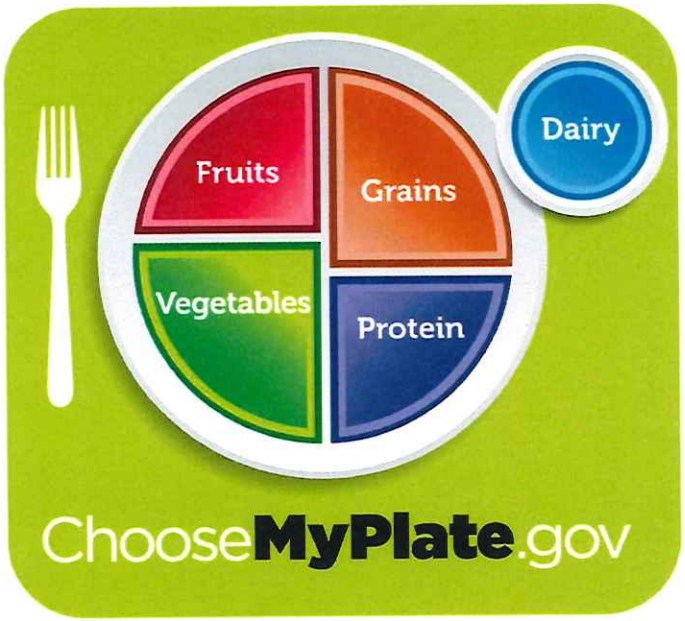
Helping Hands Portion Guide







Choosing Your Plate



① Start Here

② **Check Calories**

③ Limit these Nutrients

④ Get Enough of these Nutrients

⑤ **Footnote**

Nutrition Facts

Serving Size 1 cup (228g)
Servings Per Container 2

Amount Per Serving

Calories 250 Calories from Fat 110

	% Daily Value*
Total Fat 12g	18%
Saturated Fat 3g	15%
Trans Fat 3g	
Cholesterol 30mg	10%
Sodium 470mg	20%
Total Carbohydrate 31g	10%
Dietary Fiber 0g	0%
Sugars 5g	
Protein 5g	
Vitamin A	4%
Vitamin C	2%
Calcium	20%
Iron	4%

* Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

⑥ Quick Guide to % DV

- 5% or less is Low
- 20% or more is High

Suggestions for Making Healthier Food Choices

Eat More

- Whole grains: whole grain pasta, brown rice, whole grain bread, steel-cut oats/oatmeal
- Water or sparkling water
- Fresh or frozen fruits
- Fresh or frozen vegetables
- Homemade meals
- Low-fat dairy products
- Cook with unsaturated fats: olive oil, vegetable oil, canola oil, and soybean oil
- Food sources that naturally contain vitamins and minerals

Eat Less

- Refined grains: regular pasta, white rice, white bread
- Sugary drinks: sports drinks, juices, sodas
- Alcoholic drinks
- Fast food/eating out
- Fried foods
- Saturated fats: butter, margarine, coconut oil, lard
- Food with high sugar and fat content
- Vitamins and mineral supplements (talk to your doctor about only taking the vitamin and mineral supplements that you need)

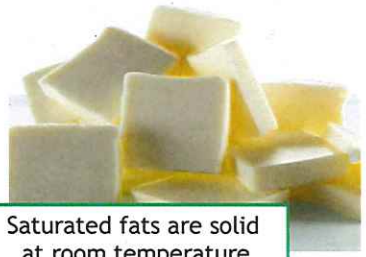
Understanding Grains and Fats

Eat Whole Grains More

- Brown rice
- Quinoa
- Buckwheat
- Bulgur
- Millet
- Steel-cut oatmeal
- Oat bran
- Popcorn
- Whole wheat or whole grain bread, pasta, and crackers
- Barley

Eat Refined Grains Less

- White or wheat bread
- White rice
- Corn flakes
- Couscous
- White pasta
- Grits
- Regular pretzels, crackers and other snacks



Saturated fats are solid at room temperature

Unsaturated fats are liquid at room temperature

Final Nutrition Thoughts

Eat lean meats such as poultry and fish, and limit red meat.

Bake or grill foods and avoid or reduce frying.

Increase foods rich in Vitamin E such as nuts, seed and avocado.

Moderation is key

Movement is Exercise

Check with your doctor about types of exercise that are best for you and how many times a week you should exercise. **Exercise doesn't have to be scripted. It could be...**

- Cleaning
- Dancing
- Walking
- Swimming
- Running
- Hiking
- Group Sports
- Gardening

More Information

AMERICAN LIVER FOUNDATION®

www.liverfoundation.org
Free National Helpline:
1(800) GO-LIVER | (800) 465-4837

Facebook: @liverinfo
Instagram: @americanliver
X: @liverUSA
YouTube: americanliver

Appendix B

AMERICAN LIVER FOUNDATION®

TEENS TO TWENTIES

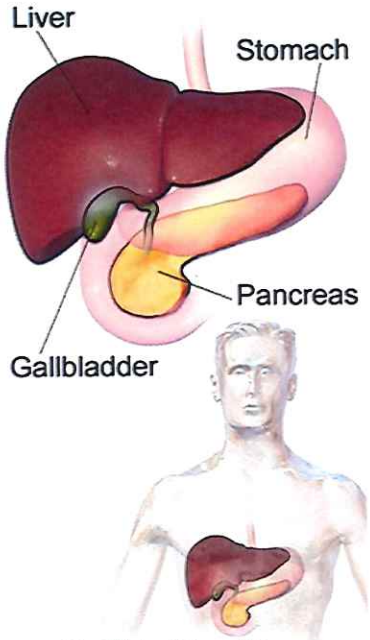
A Liver Wellness Guide

What Does Your Liver Do?

Your liver is essential to your life!

The liver is responsible for over **500 vital functions** to keep your body going and going including:

- Filtering toxins from your blood
- Managing blood clotting
- Making bile to digest fat
- Storing sugar for energy



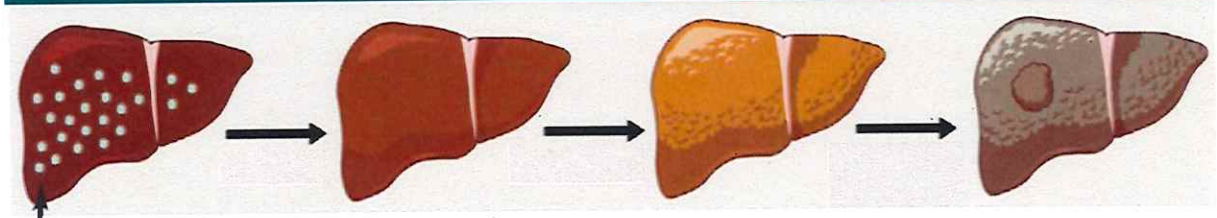
Gallbladder, Liver, and Pancreas

Chronic Liver Disease – An Overview

4.5 MILLION
American adults **diagnosed** with chronic liver disease.

30,000
American adults **die annually** from chronic liver disease.

Chronic Liver Disease Progression:



- Toxins (i.e. drugs, alcohol, chemicals)
- Viral Hepatitis
- Fatty Liver Disease

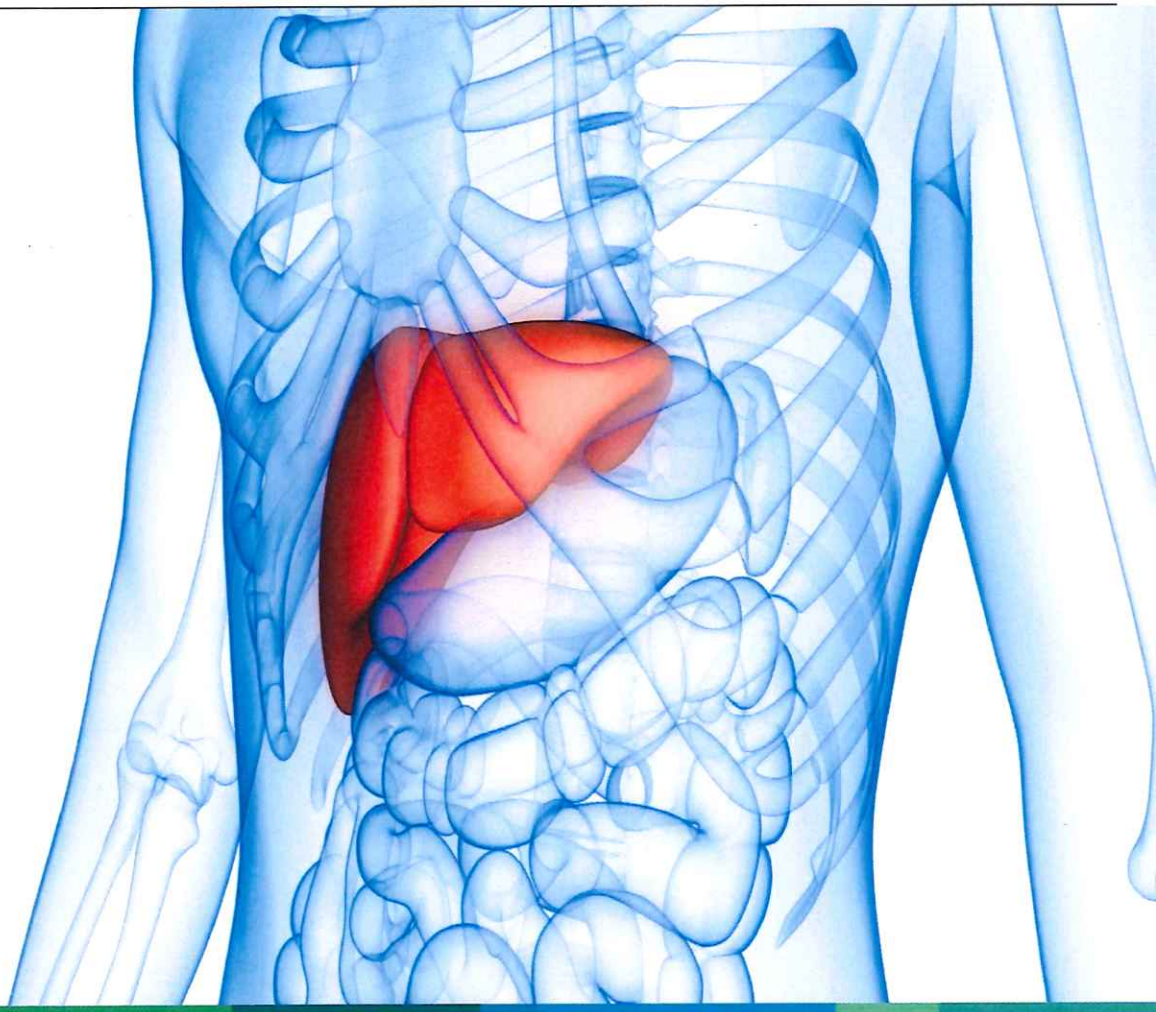
Chronic Liver Disease

Cirrhosis

Decompensated Cirrhosis

Did You Know?

- Your liver is the **largest solid internal organ** in the body.
- Located just under the rib cage on the right side of your body, the liver is approximately the **size of a football** and **weighs about 3-3.5lbs** (1.36-1.59kg).
- The liver is the only solid internal organ that can **heal and regenerate itself**.
- The liver **does not have nerve endings**.

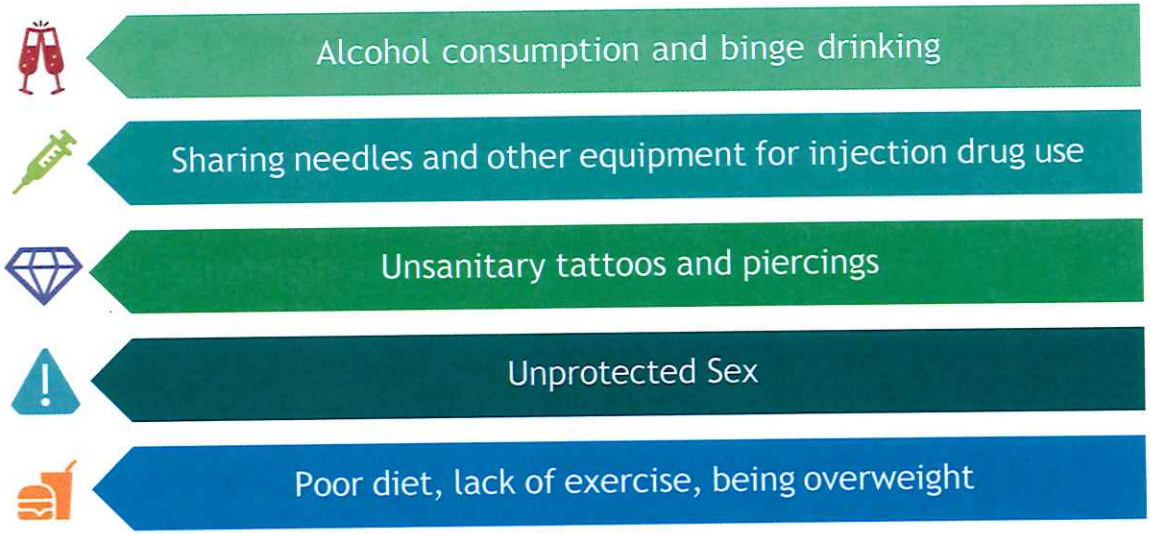


Prevalence of Liver Disease

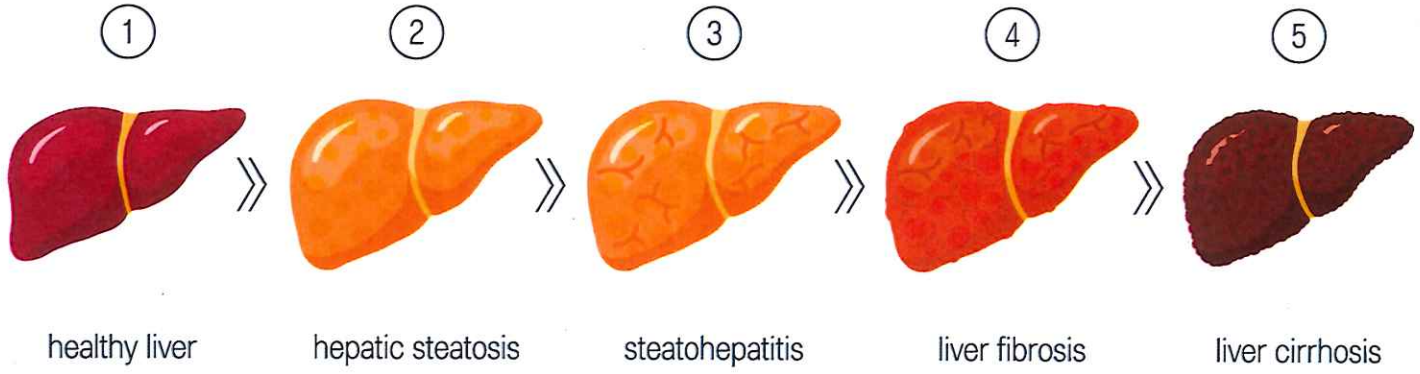
It is estimated that there are **100 million Americans** affected by more than **100 different types of liver disease**, including:

- Viral Hepatitis
- Genetic Liver Diseases
- Autoimmune Liver Diseases
- Fatty Liver Disease
- Alcohol-Associated Liver Disease

Risks for Liver Disease



STAGES OF LIVER DAMAGE



Cirrhosis of the liver occurs over time (approximately 10 to 30 years) as healthy liver tissue is replaced by scar tissue that blocks and prevents the liver from functioning properly.

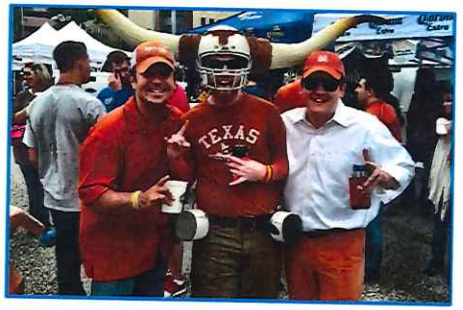
Livers with cirrhosis shrink and become lumpy and dark in color.

Alcohol plays a central role many American cultures:

Social Drinking

Business Culture

College Campuses



Sporting Events

It is the most commonly-used drug among U.S. adults.

What's Considered *ONE* Drink?

ONE STANDARD U.S. DRINK (or one alcoholic drink equivalent)	**BEER** 	**MALT LIQUOR** 	**WINE** 	**SPIRITS** 
SERVING SIZE	12 ounces	8 ounces	5 ounces	1.5 ounces
% ALCOHOL BY VOLUME (ABV)	5%	5%	5%	40% (80 Proof)
NOTES	Craft beer often has a higher ABV	Hard seltzer is considered a malt liquor	Sherry and port wines tend to be higher ABV's	Cocktails are often made by mixing spirits

Alcohol & Your Liver

- The liver needs water to process alcohol from our system
- If you have any type of liver disease, alcohol can make it worse
- Alcohol-related liver disease is one of the leading causes of cirrhosis
- Alcohol combined with medications or street drugs can be harmful to your liver
- Alcohol can cause the liver to become fatty
- Other lifestyle factors, like diet or cigarette smoking, can also cause a liver to become fatty.

What is Binge Drinking?

According to the United States Centers for Disease Control (CDC), binge drinking when a male consumes **five (5) or more** drinks on an occasion and when a female consumes **four (4) or more** drinks on an occasion.

- One in six US adults binge drinks, with **25%** doing so weekly.
- More than half of binge drinks are consumed by adults **35 and older**.
- Four out of five binge drinks are consumed **by men**.

What is Alcohol Misuse?

- Alcohol misuse is a pattern of drinking that interferes with daily activities.

- Physical and psychosocial issues of alcohol misuse may include:
  - Irritability and mood swings
  - Reduced inhibitions
  - Lack of focus
  - Memory problems
  - Depression and/or Anxiety
  - Legal Issues

- Alcohol misuse that becomes severe is given the medical diagnosis of "alcohol use disorder" or AUD.

What is Alcohol Use Disorder?

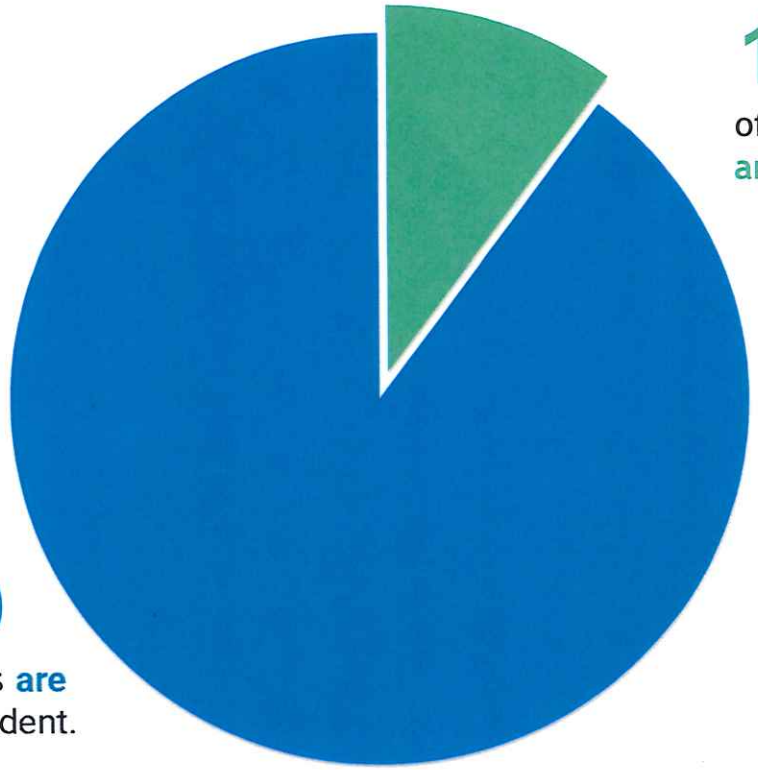
According to the United States National Institute on Alcohol Abuse and Alcoholism, alcohol use disorder (AUD) is a medical condition characterized by an impaired ability to stop or control alcohol use despite adverse social, occupational, or health consequences. AUD is considered a brain disorder and can be mild, moderate, or severe.

29.5 million Americans ages 12+ have been diagnosed with AUD in the last year.*

Excessive alcohol use caused **178,000 American deaths**, around 488 per day, **in 2020-2021.**

A **29% increase** over 2016-2017.

Did You Know?



10.2%
of excessive drinkers **are** alcohol dependent.

9 IN 10
excessive drinkers **are not** alcohol dependent.

Did You Know?

The liver filters and breaks down alcohol so it can be removed from your body.

Drinking more alcohol than the body can process at any given time can cause serious liver injury, causing preventable diseases, even in young people.

Types of liver injury that can occur:

Alcohol-associated hepatitis

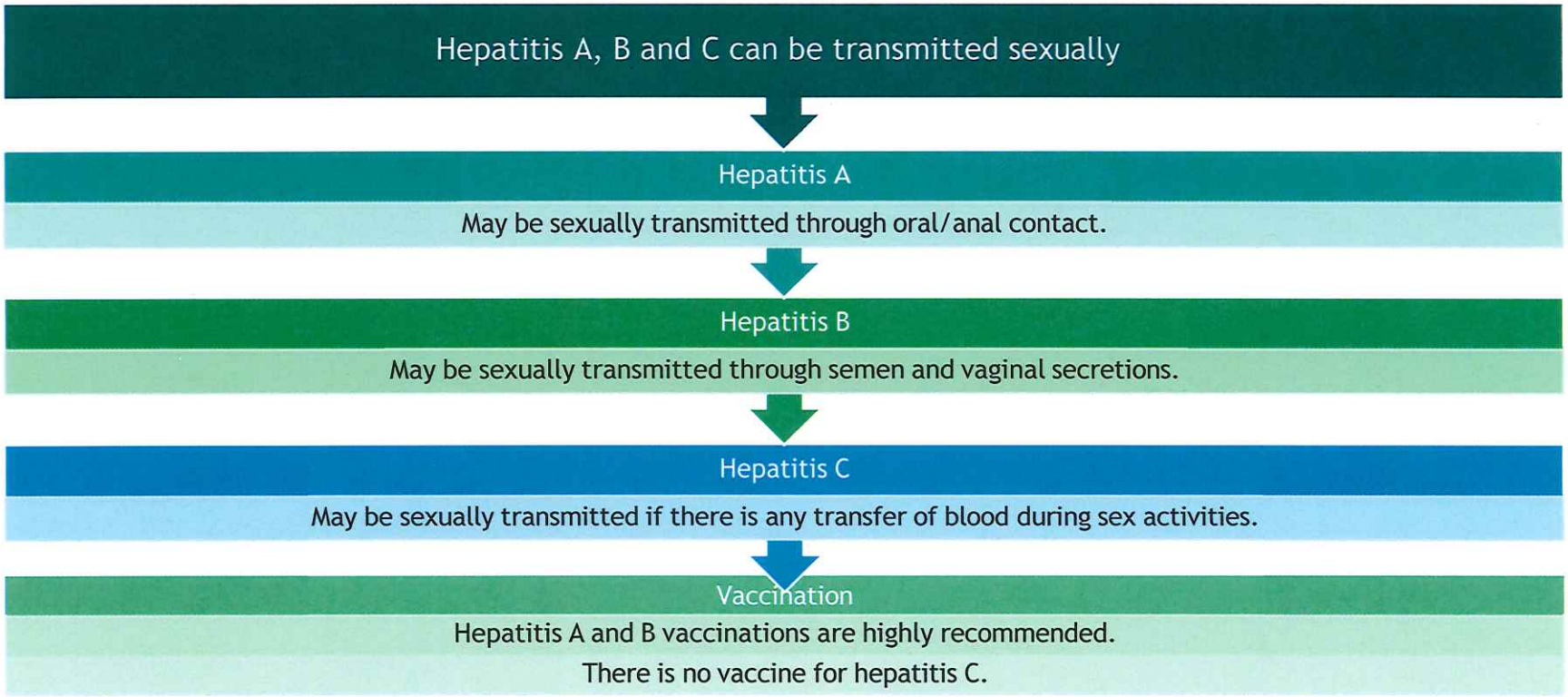
Alcohol-associated fatty liver disease

Alcohol-associated cirrhosis

A, B C's of Viral Hepatitis

	How is it spread?	Is it Acute or Chronic?	Can I become infected more than once?	Can I get vaccinated?
Hepatitis A	Exposure to small particles of infected fecal matter	Acute infection	No	Yes
Hepatitis B	Exposure to infected blood or bodily fluids	Around 5% of healthy adults will develop a chronic infection	No	Yes
Hepatitis C	Exposure to infected blood	Approximately 75% of healthy adults will develop a chronic infection	Yes	No

A, B C's of Viral Hepatitis



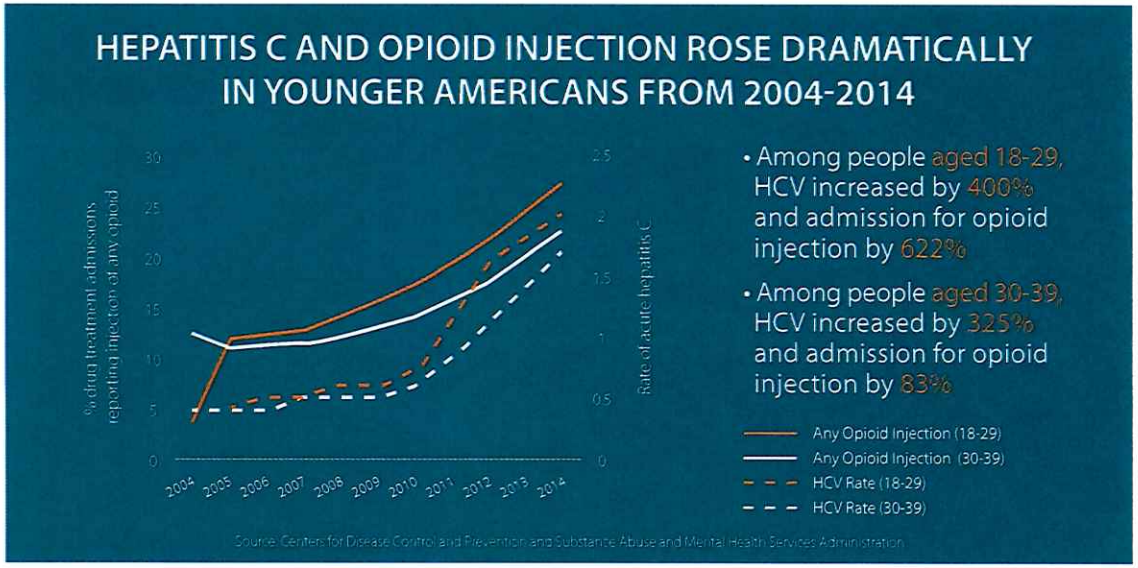
Hepatitis C & Opioid Epidemic

Opioids are a class of drugs used to relieve pain. There are legal and illegal forms of opioids such as Oxycodone (OxyContin), Hydrocodone (Vicodin), Morphine, Fentanyl and Heroin.

3X

More Cases

Overprescribing and misuse of prescription painkillers has contributed to a widespread increase in opioid injections (i.e. heroin). The increase has caused hepatitis C cases to triple over the last two decades.



Hepatitis C & Drug Use

Injection Drug Use

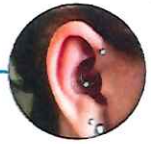
- Sharing needles of any kind greatly increases your risk for hepatitis C infection
- Blood may remain on the tip of the needle or inside the syringe, even if people attempt to clean the syringe.

Intranasal Drug Use

- Sharing equipment for intranasal drugs such as cocaine is also a risk for hepatitis C infection.
- Sharing any equipment that can cause a nick or cut within the nose can transmit hepatitis C from person to person.

Hepatitis C & Body Art

Unsanitary tattooing and piercing can transmit hepatitis C.



Always go to a trained professional—avoid "do-it-yourself" or at home tattoo or piercing.

Make sure your tattoo and piercing shop follows **state AND local laws**. Check with your local department of health to learn more.

A tattoo artist should wear **gloves and** use **new needles** and **ink** supplies for each customer.

Reusable equipment must be sterilized using special equipment to prevent infection.

Hepatitis C & Other Risks

Sharing razors and hygiene equipment with other people puts you at risk for hepatitis C. If they cut themselves, a small amount of their blood may be on the item - and if they have hepatitis C, that blood can then infect YOU if it enters your bloodstream.

Avoid practices such as "blood brothers" or "blood pacts."

Avoid medical risks - always call for emergency help if you are with someone who is injured and bleeding.

Drug Induced Liver Injury

Prescription Medications

- Require a doctor to write a prescription
- Require a pharmacist to dispense
- Closely monitored and regulated
- Rules for producing and marketing

Supplements

- Intended to supplement your diet. Some include weight loss products, detoxes or cleanses, protein powers, etc.
- Contains vitamins, minerals, amino acids, herbs or botanicals and other substances
- Not closely monitored or regulated
- Few production and marketing rules

Over-the-Counter Medications

- Does not require a prescription
- Safe when used as instructed on the label
- Important to share what medications you take with your doctor
- Closely monitored and regulated
- Rules for producing and marketing

Medications & Your Liver

- The liver filters and breaks down everything you put into your body
- Many dietary supplements are associated with liver damage
- Some products interact badly with prescription medications, making them less effective or even dangerous
- Always tell your doctor every you take

Acetaminophen & The Liver

Acetaminophen is a chemical compound used for pain relief and reducing a fever

Found in over 600 prescription and over-the-counter medications

Can be in the form of pills, syrups and drops

Acetaminophen overdose is the most common cause of drug induced liver injury

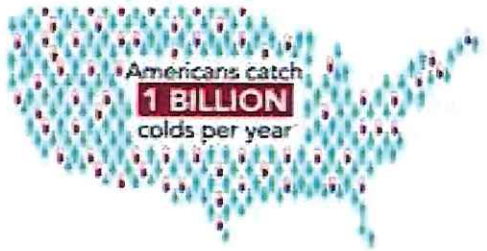
In high doses, toxic to the liver

Taken properly, safe for most people

Read all medication instructions before you take them

Double check ingredients so you **don't double up** on acetaminophen

www.knowyourdose.org



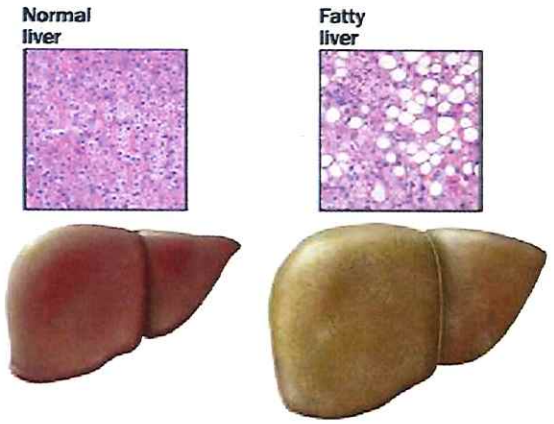
7 in 10 Americans use over-the-counter medicines to treat cold and flu symptoms each year

MORE THAN 600 over-the-counter and prescription medicines contain acetaminophen, including many for cold and flu symptoms

TAKE ONLY 1 medicine at a time that contains acetaminophen

Metabolic Dysfunction–Associated Steatotic Liver Disease (MASLD)*

- MASLD is caused from excess fat around your liver. MASLD is a known risk factor for cardiovascular disease and cancer.
- Metabolic dysfunction-associated steatohepatitis (MASH)* is when there is inflammation associated with the excess in your liver fat. This can impair the liver's ability to function and lead to scarring and other complications.
- MASLD may cause cirrhosis, or severe scarring, due to inflammation over time.

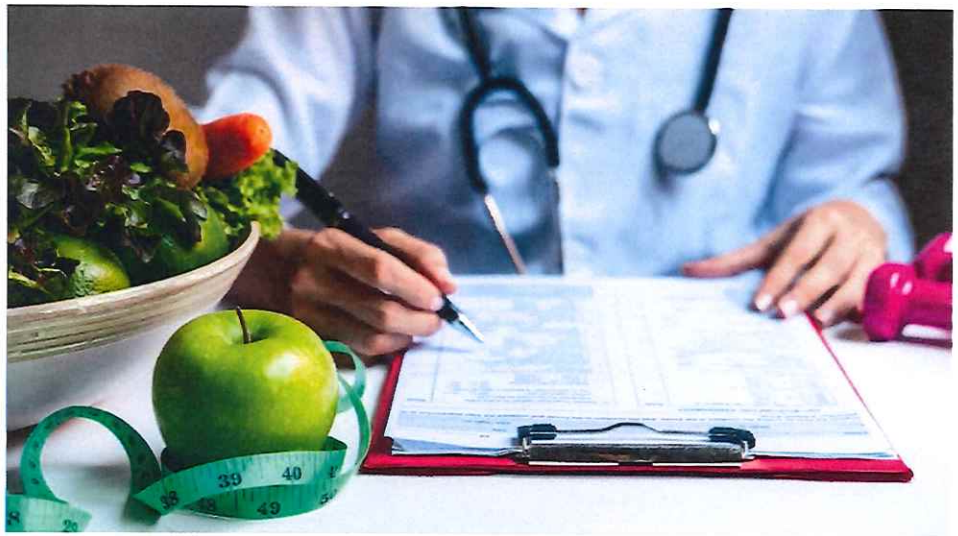


In America, roughly...	100 Million People have MASLD	8-12 Million People have MASH	10% of Children Ages 2-19 have MASLD

*Nomenclature update: fatty liver disease is now steatotic liver disease, nonalcoholic fatty liver disease (NAFLD) is now metabolic dysfunction-associated steatotic liver disease (MASLD), and nonalcoholic steatohepatitis (NASH) is now metabolic dysfunction-associated steatohepatitis.

Tips to Avoid MASLD

- Eat healthy foods like veggies, fruit, baked or grilled foods, whole grains and low-fat dairy products.
- Limit greasy fast food, sugary drinks and other junk foods.
- Get a bit of physical activity every day – walk, cycle, swim or join a group sport.
- Avoid harmful toxins that may damage your liver such as alcohol and drugs, and always talk to your doctor before starting any new medications or supplements.



Think Liver Think Life®

ARE YOU AT RISK?

ALF launched its public health campaign, Think Liver Think Life®, to raise awareness and screen Americans for metabolic dysfunction-associated steatotic liver disease. Find out if you are at risk today by taking our liver health quiz at thinkliverthinklife.org.

AMERICAN LIVER FOUNDATION™

Thank you! For more information about American Liver Foundation (ALF), our programs and resources, please visit our website, liverfoundation.org or call our free national Helpline at 1(800)GO-LIVER.

Like us on social media for the latest updates:

Facebook: @liverinfo
Instagram: @americanliver
Twitter: @liverUSA
YouTube: americanliver

Appendix C

Appendix C: Fructose

1: Highlight unexpected/unsuspected sources of fructose that may slip into foods: (actually highlighted ones that individuals may not typically consider or note in studies)

A) Top fructose sources:

i. Sugar-sweetened beverages- what is interesting is the definition and inclusion of what a "sugar-sweetened beverage" is. Some studies include just sodas, fruit drinks/fruit aides (actually listed as a high source in several studies on its own just like soda), sports, and energy drinks. A few studies include fruit juice as they point out that when consumed in large quantities it can contribute to "excess fructose despite other nutritional properties". **Only some studies include Tea and Coffee additives or "drive through drinks" i.e. coolattas, frozen hot chocolates etc. I see a tremendous amount of these beverages consumed and I am not sure they are thought of as much as sodas, sports drinks, or fruit drinks**

ii. Sugars and sweets/Candies

iii. Processed and prepared foods: again, I think the importance of this category lies in the definition. Most research groups this with desserts or sweet snacks which may include (ice cream, cookies, pastries) but research and individuals may not be looking at granola bars, even some "protein bars", fruit leathers, dried fruits/trail mixes (that contain dried sweetened fruits and candy pieces), canned fruits in syrup, and sauces/marinades/and dressings used in the preparation of food

iv. Sweetened cereals

v. Sweetened dairy drinks-I am not sure how "aware people are of this, but seems like it may get clumped into beverages"

vi. Yogurt (sweetened)

vii. Possibly looking more at items containing honey, molasses, agave, and ingredients with both HFCS and sucrose (fructose/glucose) for processed foods

2: Age/Gender/Race/ethnic-specific staple foods worth highlighting from the NHANES data:

US Youth:

i. 64.5% Boys vs. 61.3% girls consumed $\geq$ 1 sugar-sweetened beverage, the majority consuming 1 beverage for either group

ii. Calories consumed from sugar-sweetened beverages/day increased with age for both boys and girls

iii. For boys, similar percentage of total calories from sugar-sweetened beverages was similar amongst groups (Non-Hispanic white, non-Hispanic black, and Hispanic boys)

iv. For girls, highest calorie intake and highest percentage of total calories consumed from sugar-sweetened beverages was seen amongst non-Hispanic black girls compared to other groups (Non-Hispanic white, and Hispanic girls)

v. Non-Hispanic Asian boys and girls consumed the least calories and had the lowest mean percentage of total calories consumed from sugar-sweetened beverages on a given day compared with other race and Hispanic-origin groups

US adults:

i. Mean percentage of total calories from added sugars decreased with increasing age and increasing income

ii. Non-Hispanic black men and women consumed a larger percentage of total calories from added sugars than non-Hispanic white and Mexican-American men and women

iii. More of the calories from added sugars came from foods rather than beverages

iv. The majority of calories from added sugars were consumed at home rather than away from home

Appendix D

WORKING GROUP TO STUDY NONALCOHOLIC FATTY LIVER DISEASE, INCLUDING NONALCOHOLIC FATTY LIVER AND NONALCOHOLIC STEATOHEPATITIS (NASH)

All Members are Appointed by the Co-Chairs of the Public Health Committee Unless Stated

Membership

No.	Specific Qualifications	Appointee
1	A physician with expertise in hepatology and gastroenterology representing an institution of higher education in the state	Wajahat Mehal MD, of New Haven
2	Person in the state living with nonalcoholic fatty liver disease	
3	Person in the state living with nonalcoholic fatty liver disease	Ivelisse Alvarado
4	Person in the state living with nonalcoholic fatty liver disease	Alesia Ricks-Harris, of New Haven
5	Representative of a patient advocacy organization in the state	Jorge Moreno MD, of New Haven
6	A social worker with experience working with communities in underserved areas in the state and addressing social determinants of health	Denise Dawson, of New Haven
7	An expert in health care policy in the state with experience in advising on regulatory frameworks, health care access and insurance issues	Bubu Banini MD, of New Haven
8	A nutritionist and dietician in the state with experience in providing guidance on preventative measures and dietary interventions related to nonalcoholic fatty liver disease	Elizabeth Richardson MD, of Hartford Alison Giguere, of Old Saybrook
9	A community health worker who works directly with underserved communities in the state in addressing social determinants of health	Andy Beltran, of Hartford
10	A representative of a nonprofit organization in the state focused on liver health	Xuehong Zhang MD, of Orange
11	The Commissioner of Public Health, or the commissioner's designee	Elizabeth Conklin, of Hartford