**Supplementary Figure 1:** Flowchart of participants from NHANES. Because US-FLI used FPG, only a fasting subsample was used. FPG: Fasting plasma glucose; MAFLD: Metabolic associated fatty liver disease; NAFLD: Nonalcoholic fatty liver disease; NHANES: National Health and Nutrition Examination Survey; US-FLI: Ultrasound-fatty liver index.

**Supplementary Table 1: Potential risk factors associated with MAFLD.**

| Risk factors | MAFLD, OR (95% CI) | *P*-value |
| --- | --- | --- |
| Male sex | 2.65 (2.34, 3.02) | <0.001 |
| Age per 10 years | 1.09 (1.05, 1.13) | <0.001 |
| White *vs.* Mexican American | 0.34 (0.29, 0.40) | <0.001 |
| Black *vs.* Mexican American | 0.16 (0.14, 0.19) | <0.001 |
| Completed high-school education or above | 0.96 (0.82, 1.11) | 0.554 |
| At or below poverty line | 1.13 (0.99, 1.28) | 0.068 |
| Current smoking | 0.90 (0.78, 1.04) | 0.146 |
| Central obesity | 12.96 (11.40,14.73) | <0.001 |
| Diabetes | 3.23 (2.82, 3.70) | <0.001 |
| Systolic BP per 10 mmHg | 1.14 (1.10, 1.17) | <0.001 |
| LDL per 20 mg/dL | 0.99 (0.96, 1.02) | 0.529 |
| High-density lipoprotein per 10 mg/dL | 0.74 (0.70, 0.78) | <0.001 |
| Triglycerides per 100 mg/dL | 1.85 (1.69, 2.02) | <0.001 |

Multivariate logistic regression analyses were used. Central obesity was defined by waist circumference ≥102 cm in men or waist circumference ≥88 cm in women. SI conversion factors: To convert total, LDL, and high-density lipoprotein cholesterol to mmol/L, multiply by 0.0259; triglycerides to mmol/L, multiply by 0.0113. BP: Blood pressure; CI: Confidence interval; LDL: Low-density lipoprotein; MAFLD: Metabolic associated fatty liver disease; OR: Odds ratio.

**Supplementary Table 2: Mean BP, lipid, glycemic, and weight levels in US adults aged 20 years and older by MAFLD and NAFLD status, 1999–2016.**

| Items | 1999–2002 (n = 3954) | 2003–2006 (n = 3789) | 2007–2010 (n = 5003) | 2011–2016 (n = 6871) | Total | $P_{trend}$ | $P_{interaction}$ | P* | β (95% CI)** |
|---|---|---|---|---|---|---|---|---|---|
| **Systolic BP (mmHg)** | | | | | | | | | |
| Whole population | | | | | | | | | |
| MAFLD | 128.0 (127.0, 129.1) | 126.4 (125.4, 127.4) | 123.7 (122.9, 124.6) | 126.8 (125.9, 127.7) | 126.2 (125.7, 126.7) | 0.026 | 0.108 | 0.003 | 4.81 (4.27, 5.35) |
| NAFLD | 127.8 (126.6, 128.9) | 126.1 (125.0, 127.2) | 123.5 (122.6, 124.4) | 126.4 (125.5, 127.3) | 125.9 (125.4, 126.4) | 0.021 | 0.313 | | 4.17 (3.54, 4.80) |
| Non-MAFLD | 120.7 (119.7, 121.8) | 119.4 (118.4, 120.3) | 117.0 (116.0, 118.1) | 118.7 (118.1, 119.4) | 118.9 (118.5, 119.4) | <0.001 | | | |
| Non-NAFLD | 121.0 (120.0, 122.0) | 119.7 (118.7, 120.6) | 117.4 (116.3, 118.4) | 119.3 (118.5, 120.0) | 119.3 (118.9, 119.8) | <0.001 | | | |
| Individuals with hypertension | | | | | | | | | |
| MAFLD | 137.2 (135.5, 138.8) | 134.5 (133.0, 136.1) | 130.7 (129.6, 131.8) | 134.2 (132.8, 135.6) | 134.0 (133.2, 134.7) | 0.001 | <0.001 | 0.225 | −2.25 (−3.36, −1.15) |
| NAFLD | 137.0 (135.3, 138.7) | 134.6 (132.9, 136.3) | 130.5 (129.4, 131.8) | 133.8 (132.3, 135.3) | 133.8 (133.0, 134.6) | 0.001 | 0.004 | | −2.81 (−4.13, −1.50) |
| Non-MAFLD | 143.7 (142.1, 145.2) | 139.4 (137.5, 141.2) | 133.7 (131.7, 135.7) | 134.7 (132.7, 136.7) | 137.5 (136.4, 138.5) | <0.001 | | | |
| Non-NAFLD | 143.5 (141.7, 145.2) | 139.0 (137.3, 140.8) | 133.7 (131.7, 135.7) | 135.0 (132.8, 137.3) | 137.4 (136.3, 138.5) | <0.001 | | | |
| **LDL cholesterol (mg/dL)** | | | | | | | | | |
| Whole population | | | | | | | | | |
| MAFLD | 127.0 (123.6, 130.5) | 117.1 (114.3, 120.0) | 118.9 (116.3, 121.6) | 115.6 (113.5, 117.7) | 118.6 (117.3, 120.0) | 0.026 | 0.108 | 0.473 | 2.01 (0.61, 3.40) |
| NAFLD | 126.6 (123.3, 130.0) | 117.5 (114.7, 120.2) | 118.6 (115.9, 121.3) | 115.4 (113.3, 117.5) | 118.5 (117.2, 119.8) | <0.001 | 0.894 | | 1.65 (0.24, 3.07) |
| Non-MAFLD | 121.6 (119.8, 123.4) | 116.0 (114.2, 117.8) | 114.8 (113.2, 116.3) | 111.9 (110.7, 113.1) | 115.6 (114.8, 116.3) | <0.001 | | | |
| Non-NAFLD | 121.9 (120.0, 123.8) | 115.9 (114.1, 117.7) | 115.0 (113.4, 116.6) | 112.2 (110.9, 113.4) | 115.7 (114.9, 116.5) | <0.001 | | | |
| Individuals with dyslipidemia | | | | | | | | | |
| MAFLD | 145.2 (140.9, 149.5) | 132.8 (128.4, 137.3) | 132.8 (129.6, 136.1) | 127.3 (124.2, 130.3) | 132.7 (130.9, 134.6) | <0.001 | 0.688 | 0.044 | −6.72 (−8.85, −4.59) |
| NAFLD | 145.2 (140.9, 149.4) | 132.6 (128.1, 137.0) | 132.1 (128.7, 135.5) | 126.7 (123.6, 129.8) | 132.2 (130.4, 134.1) | <0.001 | 0.483 | | −7.24 (−9.38, −5.09) |
| Non-MAFLD | 151.3 (148.8, 153.8) | 144.0 (141.4, 146.6) | 142.0 (138.9, 145.1) | 136.0 (134.1, 137.9) | 142.5 (141.3, 143.8) | <0.001 | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Non-NAFLD | 151.1 (148.7, 153.5) | 143.9 (141.4, 146.4) | 142.1 (139.0, 145.3) | 136.0 (134.0, 137.9) | 142.4 (141.2, 143.7) | <0.001 | | | |
| **Fasting glucose (mg/dL)** | | | | | | | | | |
| Whole population | | | | | | | | | |
| MAFLD | 118.0 (114.9, 121.0) | 114.5 (112.1, 116.8) | 116.0 (114.0, 117.9) | 118.8 (116.7, 120.9) | 117.1 (115.9, 118.3) | 0.422 | 0.118 | 0.694 | 17.56 (16.38, 18.74) |
| NAFLD | 117.5 (114.5, 120.5) | 114.6 (111.9, 117.3) | 115.8 (113.9, 117.8) | 119.2 (116.8, 121.5) | 117.2 (115.9, 118.4) | 0.226 | 0.059 | | 16.96 (15.67, 18.24) |
| Non-MAFLD | 97.3 (96.4, 98.2) | 97.6 (96.5, 98.6) | 97.3 (96.5, 98.1) | 96.9 (96.3, 97.5) | 97.2 (96.8, 97.7) | 0.041 | | | |
| Non-NAFLD | 98.0 (97.2, 98.9) | 97.9 (97.0, 98.9) | 98.0 (97.1, 98.9) | 97.6 (97.0, 98.3) | 97.9 (97.5, 98.3) | 0.041 | | | |
| Individuals with diabetes | | | | | | | | | |
| MAFLD | 165.5 (157.2, 173.8) | 155.9 (147.1, 164.7) | 155.4 (148.3, 162.5) | 163.7 (158.2, 169.2) | 160.7 (157.1, 164.3) | 0.771 | 0.217 | 0.690 | 20.18 (14.36, 26.00) |
| NAFLD | 163.6 (155.1, 172.2) | 155.6 (146.1, 165.1) | 154.2 (147.2, 161.3) | 165.0 (158.7, 171.3) | 160.5 (156.7, 164.4) | 0.405 | 0.057 | | 17.19 (11.32, 23.06) |
| Non-MAFLD | 148.0 (131.9, 164.0) | 142.1 (130.1, 154.0) | 138.0 (129.1, 146.8) | 137.6 (131.4, 143.8) | 140.3 (135.4, 145.2) | 0.148 | | | |
| Non-NAFLD | 154.6 (140.5, 168.9) | 143.6 (132.4, 154.8) | 142.0 (132.9, 151.2) | 139.4 (133.9, 144.8) | 143.3 (138.8, 147.8) | 0.049 | | | |
| **Glycosylated hemoglobin (%)** | | | | | | | | | |
| Whole population | | | | | | | | | |
| MAFLD | 5.9 (5.8, 6.0) | 5.8 (5.7, 5.8) | 5.9 (5.8, 6.0) | 6.0 (6.0, 6.1) | 5.9 (5.9, 6.0) | 0.009 | 0.697 | 0.022 | 0.48 (0.44, 0.52) |
| NAFLD | 5.9 (5.8, 6.0) | 5.8 (5.7, 5.9) | 5.9 (5.8, 6.0) | 6.1 (6.0, 6.1) | 5.9 (5.9, 6.0) | 0.005 | 0.525 | | 0.48 (0.44, 0.52) |
| Non-MAFLD | 5.3 (5.2, 5.3) | 5.3 (5.3, 5.4) | 5.4 (5.4, 5.5) | 5.4 (5.4, 5.5) | 5.4 (5.4, 5.4) | <0.001 | | | |
| Non-NAFLD | 5.3 (5.2, 5.3) | 5.3 (5.3, 5.4) | 5.4 (5.4, 5.5) | 5.5 (5.4, 5.5) | 5.4 (5.4, 5.4) | <0.001 | | | |
| Individuals with diabetes | | | | | | | | | |
| MAFLD | 7.4 (7.1, 7.7) | 7.0 (6.8, 7.2) | 7.1 (6.9, 7.3) | 7.5 (7.3, 7.7) | 7.3 (7.2, 7.4) | 0.130 | 0.726 | 0.329 | 0.36 (0.19, 0. 52) |
| NAFLD | 7.3 (7.0, 7.6) | 7.1 (6.8, 7.3) | 7.1 (6.9, 7.2) | 7.6 (7.4, 7.8) | 7.3 (7.2, 7, 4) | 0.054 | 0.261 | | 0.37 (0.19, 0.55) |
| Non-MAFLD | 6.9 (6.5, 7.3) | 6.9 (6.6, 7.3) | 7.0 (6.7, 7.2) | 7.1 (6.9, 7.3) | 7.0 (6.9, 7.1) | 0.474 | | | |
| Non-NAFLD | 7.0 (6.7, 7.4) | 6.9 (6.6, 7.2) | 7.0 (6.7, 7.3) | 7.0 (6.9, 7.2) | 7.0 (6.9, 7.1) | 0.996 | | | |
| **BMI (kg/m$^2$)** | | | | | | | | | |
| Whole population | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAFLD | 33.1 (32.5, 33.8) | 34.1 (33.5, 34.7) | 33.4 (33.0, 33.7) | 34.5 (34.0, 34.9) | 33.9 (33.6, 34.2) | 0.001 | 0.058 | <0.001 | 8.30 (8.02, 8.58) |
| NAFLD | 33.3 (32.6, 33.9) | 34.3 (33.7, 34.9) | 33.5 (33.1, 33.9) | 34.7 (34.2, 35.1) | 34.1 (33.8, 34.3) | <0.001 | 0.055 | | 8.18 (7.89, 8.46) |
| Non-MAFLD | 25.8 (25.6, 26.0) | 26.2 (26.0, 26.3) | 26.0 (25.7, 26.2) | 26.2 (26.0, 26.5) | 26.1 (25.9, 26.2) | 0.103 | | | |
| Non-NAFLD | 26.0 (25.8, 26.2) | 26.3 (26.1, 26.5) | 26.2 (25.9, 26.4) | 26.5 (26.2, 26.7) | 26.3 (26.1, 26.4) | 0.027 | | | |
| Individuals with general obesity | | | | | | | | | |
| MAFLD | 36.3 (35.6, 37.0) | 36.9 (36.3, 37.4) | 36.3 (35.9, 36.7) | 37.0 (36.5, 37.5) | 36.7 (36.4, 37.0) | 0.046 | 0.006 | 0.001 | 4.24 (3.92, 4.57) |
| NAFLD | 36.3 (35.6, 37.1) | 37.0 (36.5, 37.6) | 36.4 (36.0, 36.8) | 37.1 (36.7, 37.6) | 36.8 (36.5, 37.1) | 0.025 | 0.005 | | 3.94 (3.61, 4.27) |
| Non-MAFLD | 33.8 (33.4, 34.3) | 33.9 (33.6, 34.2) | 33.6 (33.3, 33.9) | 33.2 (32.9, 33.5) | 33.5 (33.4, 33.7) | 0.028 | | | |
| Non-NAFLD | 34.1 (33.6, 34.5) | 33.9 (33.6, 34.2) | 33.8 (33.5, 34.2) | 33.4 (33.0, 33.7) | 33.7 (33.5, 33.9) | 0.058 | | | |
| **Waist circumference (cm)** | | | | | | | | | |
| Whole population | | | | | | | | | |
| MAFLD | 110.6 (109.0, 112.1) | 113.5 (112.2, 114.7) | 111.4 (110.6, 112.2) | 114.1 (113.1, 115.0) | 112.7 (112.1, 113.3) | <0.001 | 0.210 | <0.001 | 20.90 (20.29, 21.52) |
| NAFLD | 110.5 (108.9, 112.1) | 113.6 (112.4, 114.8) | 111.8 (110.8, 112.7) | 114.4 (113.5, 115.4) | 112.9 (112.4, 113.5) | <0.001 | 0.152 | | 20.46 (19.83, 21.09) |
| Non-MAFLD | 89.6 (89.1, 90.2) | 91.4 (90.8, 91.9) | 91.0 (90.3, 91.7) | 91.9 (91.3, 92.6) | 91.1 (90.8, 91.4) | <0.001 | | | |
| Non-NAFLD | 90.2 (89.7, 90.8) | 91.9 (91.3, 92.5) | 91.5 (90.9, 92.2) | 92.7 (92.1, 93.3) | 91.7 (91.4, 92.0) | <0.001 | | | |
| Individuals with central obesity | | | | | | | | | |
| MAFLD | 113.7 (112.0, 115.4) | 116.0 (114.9, 117.1) | 114.3 (113.4, 115.2) | 116.4 (115.5, 117.3) | 115.4 (114.8, 116.0) | 0.001 | 0.024 | 0.005 | 13.13 (12.50, 13.75) |
| NAFLD | 113.6 (111.9, 115.4) | 116.2 (115.1, 117.4) | 114.5 (113.6, 115.5) | 116.6 (115.7, 117.5) | 115.5 (115.0, 116.1) | 0.001 | 0.029 | | 12.59 (11.96, 13.21) |
| Non-MAFLD | 100.6 (100.0, 101.2) | 101.2 (100.6, 101.7) | 101.2 (100.5, 101.9) | 101.5 (100.9, 102.0) | 101.2 (100.9, 101.5) | 0.089 | | | |
| Non-NAFLD | 101.5 (100.9, 102.1) | 101.8 (101.2, 102.4) | 101.8 (101.1, 102.5) | 102.4 (101.8, 103.1) | 102.0 (101.6, 102.3) | 0.043 | | | |

Data are from the NHANESs between 1999 and 2016. Data are expressed as mean (95% CI). $P_{trend}$ was calculated for each MAFLD group by including a continuous variable for the midpoint of each survey period in logistic regression models; significant values indicated variation over time within MAFLD groups. BP: Blood pressure; BMI: Body mass index; CI: Confidence interval; LDL: Low-density lipoprotein; MAFLD: Metabolic associated fatty liver disease; NHANESs: National Health and Nutrition Examination Surveys; NAFLD: Nonalcoholic fatty liver disease.

*MAFLD *vs.* NAFLD; ** *vs.* non-MAFLD or non-NAFLD.

**Supplementary Table 3: Cardiovascular and renal markers in MAFLD with and without significant alcohol use.**

| Variables | MAFLD without significant alcohol use | MAFLD with significant alcohol use | Adjusted *P*-value |
|---|---|---|---|
| *N* | 6745 | 386 | |
| Age (years) | 50.88 (0.28) | 49.34 (1.00) | |
| Male | 57.1 (0.8) | 77.3 (2.7) | |
| BMI (kg/m$^2$) | 34.05 (0.13) | 31.64 (0.32) | <0.001 |
| Diabetes (%) | 25.0 (0.7) | 18.9 (2.5) | 0.133 |
| Hypertension (%) | 48.0 (0.9) | 52.2 (3.3) | 0.017 |
| Dyslipidemia (%) | 56.5 (0.9) | 55.4 (3.4) | 0.871 |
| General Obesity (%) | 70.8 (0.8) | 61.1 (2.9) | 0.006 |
| Central obesity (%) | 87.1 (0.6) | 79.4 (2.6) | 0.073 |
| 10-year risk of cardiovascular events (%) | | | |
|   Framingham | 12.92 (0.22) | 17.22 (1.22) | 0.017 |
|   ASCVD | 10.69 (0.22) | 11.91 (1.05) | 0.155 |
| Previous myocardial infarction (%) | 5.7 (0.3) | 3.8 (1.2) | 0.258 |
| Previous stroke (%) | 4.1 (0.3) | 2.0 (0.9) | 0.322 |
| Any CKD (%) | 18.9 (0.7) | 15.8 (2.7) | 0.849 |
| ACR ≥ 30 mg/g (%) | 13.6 (0.6) | 13.5 (2.7) | 0.668 |
| eGFR <60 mL/min per 1.73 m$^2$ (%) | 7.6 (0.4) | 2.6 (0.9) | 0.050 |
| Mean eGFR (mL/min per 1.73 m$^2$) | 92.56 (0.43) | 98.49 (0.95) | <0.001 |
| Hyperfiltration (%) | 1.4 (0.2) | 1.3 (0.5) | 0.908 |

Data are from the NHANESs between 1999 and 2016. All analyses were adjusted for age, sex, and race or ethnic group. 10-year cardiovascular risks were calculated using Framingham and ASCVD risk scores. Any CKD refers, urinary ACR ≥30 mg/g, eGFR <60 mL/min per 1.73 m$^2$, or both. Hyperfiltration was defined as eGFR ≥135 mL/min per 1.73 m$^2$. ACR: Albumin-to-creatinine ratio; ASCVD: Atherosclerotic Cardiovascular Disease guidelines (from the American Heart Association and American College of Cardiology); BMI: Body mass index; CKD: Chronic kidney disease; eGFR: Estimated glomerular filtration rate; MAFLD: Metabolic associated fatty liver disease; NHANESs: National Health and Nutrition Examination Surveys.

**Supplementary Table 4: Estimates of 10-year risk of cardiovascular events in US adults of MAFLD or NAFLD without any antihypertensive, anti-diabetic, and lipid-lowering medication, 1999–2016.**

| Items | 1999–2002 | 2003–2006 | 2007–2010 | 2011–2016 | Total | $P_{trend}$ | $P_{interaction}$ | P* | β (95% CI)** |
|---|---|---|---|---|---|---|---|---|---|
| Framingham | | | | | | | | | |
| MAFLD | 11.6 (10.4, 12.8) | 9.3 (8.6, 10.0) | 8.8 (8.2, 9.3) | 9.2 (8.2, 10.2) | 9.6 (9.1, 10.1) | 0.006 | 0.620 | 0.002 | 2.6 (2.2, 2.9) |
| NAFLD | 11.1 (9.8, 12.4) | 8.9 (8.2, 9.7) | 8.5 (8.0, 9.1) | 8.7 (8.0, 9.4) | 9.2 (8.8, 9.6) | 0.003 | 0.243 | | 2.1 (1.8, 2.5) |
| ASCVD | | | | | | | | | |
| MAFLD | 9.7 (8.3, 11.0) | 7.7 (6.9, 8.5) | 7.0 (6.3, 7.8) | 6.8 (5.9, 7.8) | 7.6 (7.1, 8.2) | 0.001 | 0.649 | 0.040 | 1.9 (1.5, 2.2) |
| NAFLD | 9.3 (7.9, 10.8) | 7.5 (6.6, 8.4) | 7.0 (6.2, 7.7) | 6.5 (5.8, 7.2) | 7.4 (6.9, 7.8) | 0.000 | 0.170 | | 1.5 (1.1, 1.8) |

Data are from the NHANESs between 1999 and 2016. Data are expressed as percentage (95% CI). All analyses were adjusted for age, sex, and race or ethnic group. 10-year cardiovascular risks were calculated using Framingham and ASCVD risk scores. $P_{trend}$ was calculated for the MAFLD status group by including a continuous variable for the midpoint of each survey period in logistic regression models; significant values indicated variation over time within MAFLD groups. Significant $P_{interaction}$ values indicate varying associations between prevalence estimates over time across MAFLD groups. ASCVD: Atherosclerotic Cardiovascular Disease guidelines (from the American Heart Association and American College of Cardiology); CI: Confidence interval; MAFLD: Metabolic associated fatty liver disease; NHANESs: National Health and Nutrition Examination Surveys; NAFLD: Nonalcoholic fatty liver disease. *MAFLD *vs.* NAFLD; ***vs.* non-MAFLD or non-NAFLD.

**Supplementary Table 5: Cardiovascular and renal markers in participants with MAFLD but non-NAFLD and NAFLD.**

| Items | MAFLD-non NAFLD | NAFLD | *P* |
|---|---|---|---|
| N | 518 | 6658 | |
| 10-year risk of cardiovascular events, % | | | |
| Framingham | 16.6 (14.6, 18.7) | 12.9 (12.4, 13.3) | 0.013 |
| ASCVD | 11.5 (9.7, 13.2) | 10.7 (10.3, 11.1) | 0.104 |
| Previous myocardial infarction, % | 4.7 (2.8, 7.7) | 5.6 (5.0, 6.3) | 0.605 |
| Previous stroke, % | 3.3 (1.7, 6.2) | 4.0 (3.4, 4.7) | 0.987 |
| Any CKD, % | 17.8 (13.5, 23.0) | 18.8 (17.5, 20.2) | 0.669 |
| ACR ≥ 30 mg/g, % | 14.3 (10.4, 19.4) | 13.6 (12.5, 14.8) | 0.499 |
| eGFR <60 mL/min per 1.73 m$^2$, % | 3.9 (2.4, 6.3) | 7.6 (6.8, 8.4) | 0.449 |
| Mean eGFR, mL/min per 1.73 m$^2$ | 97.4 (95.6, 99.2) | 92.6 (91.7, 93.4) | <0.001 |
| Hyperfiltration, % | 1.1 (0.5, 2.4) | 1.4 (1.1, 1.8) | 0.967 |

Data are from the NHANESs between 1999 and 2016. Data are expressed as percentage (95% CI). All analyses were adjusted for age, sex, and race or ethnic group. 10-year cardiovascular risks were calculated using Framingham and ASCVD risk scores. Any CKD refers, urinary ACR ≥30 mg/g, eGFR <60 mL/min per 1.73 m$^2$, or both. Hyperfiltration was defined as eGFR ≥135 mL/min per 1.73 m$^2$. ACR: Albumin-to-creatinine ratio; ASCVD: Atherosclerotic Cardiovascular Disease guidelines (from the American Heart Association and American College of Cardiology); CKD: Chronic kidney disease; CI: Confidence interval; eGFR: Estimated glomerular filtration rate; MAFLD: Metabolic associated fatty liver disease; NHANESs: National Health and Nutrition Examination Surveys; NAFLD: Nonalcoholic fatty liver disease.