

Supplemental Table 1. Study Definitions by ICD-9 and 10 Codes

| Variable | ICD-9-CM | ICD-10-CM | Comment |
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| Liver Disease Groups | | | |
| Nonalcoholic fatty liver disease (NAFLD) | 571.8 | K75.81, K76.0 | <p>Discharge records with these codes and either another chronic liver disease or alcohol condition were excluded from analysis. Excludes n=150 for concomitant chronic liver disease and additional n=45 for alcohol condition. These are weighted sample sizes based on the logistic regression analysis for 2012-2016, and these exclusions were applied after excluding patients with acute liver diseases (further defined below).</p> <p>K75.81 Nonalcoholic steatohepatitis (NASH) K76.0 Fatty liver, not elsewhere classified, Nonalcoholic fatty liver disease (NAFLD)</p> |
| Other Chronic Liver Diseases (non-NAFLD) | 571.[0123569] 571.4[0129] 573.[09] 070.2[0123] 070.3[0123] 070.4[249] 070.5[249] 070.6 070.7[01] 070.9 V02.6[0129] 273.4 275.1 453.0 576.1 | K70.[01] K70.1[01] K70.2 K70.3 K70.30 K70.31 K70.4 K70.4[01] K70.9 K71.3 K71.4 K71.5[01] K71.7 K72.1 K72.1[01] K73.[01289] K74.[0123456] K74.6[09] | <p>ICD-9 Code Descriptions</p> <p>571.0 Alcoholic fatty liver 571.1 Acute alcoholic hepatitis (included as chronic liver disease as majority of patients have chronic liver damage) 571.2 Alcoholic cirrhosis of liver 571.3 Alcoholic liver damage, unspecified 571.4 Chronic hepatitis 571.5 Cirrhosis of liver without mention of alcohol 571.6 Biliary cirrhosis 571.9 Unspecified chronic liver disease without mention of alcohol 573.0 Chronic passive congestion of liver 573.9 Unspecified disorder of liver</p> <p>070.2x/070.3x Viral hepatitis B with/without hepatic coma 070.42 Hepatitis delta without mention of active hepatitis B disease with hepatic coma, Hepatitis delta with hepatitis B carrier state 070.44 Chronic hepatitis C with hepatic coma 070.49 Other specified viral hepatitis with hepatic coma 070.5 Other specified viral hepatitis without mention of hepatic coma</p> |

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| | | <p>K75.[349] K75.4 K75.89 K76 K76.[123456789] K76.8[19] K77</p> <p>B18.[01289]</p> <p>B19.[01] B19.1[01] B19.2 B19.2[01] B19.9</p> <p>E83.01 E83.11 E83.11[0189]</p> <p>O98.41 O98.41[1239] O98.42 O98.43</p> <p>I82.0 K83.0 E88.01</p> | <p>070.52 Hepatitis delta without mention of active hepatitis B disease or hepatic coma 070.54 Chronic hepatitis C without mention of hepatic coma 070.59 Other specified viral hepatitis without mention of hepatic coma 070.6 Unspecified viral hepatitis with hepatic coma 070.7 Unspecified viral hepatitis C 070.70 Unspecified viral hepatitis C without hepatic coma, Unspecified viral hepatitis C NOS 070.71 Unspecified viral hepatitis C with hepatic coma 070.9 Unspecified viral hepatitis without mention of hepatic coma, Viral hepatitis NOS</p> <p>V02.6 Carrier or suspected carrier of viral hepatitis V02.60 Viral hepatitis carrier, unspecified V02.61 Hepatitis B carrier V02.62 Hepatitis C carrier V02.69 Other viral hepatitis carrier</p> <p>273.4 alpha 1 antitrypsin deficiency 275.1 Disorders of copper metabolism (captures Wilson's disease) 453.0 Budd-chiari syndrome 576.1 Cholangitis (captures primary sclerosing cholangitis)</p> <p>ICD-10 Code Descriptions</p> <p>K70.0 Alcoholic fatty liver K70.1 Alcoholic hepatitis K70.2 Alcoholic fibrosis and sclerosis of liver K70.3 Alcoholic cirrhosis of liver K70.3[01] Alcoholic cirrhosis of liver without/with ascites K70.4 Alcoholic hepatic failure K70.4[01] Alcoholic hepatic failure without/with coma K70.9 Alcoholic liver disease, unspecified</p> <p>K71.3 Toxic liver disease with chronic persistent hepatitis K71.4 Toxic liver disease with chronic lobular hepatitis K71.5 Toxic liver disease with chronic active hepatitis K71.5[01] Toxic liver disease with chronic active hepatitis without/with ascites</p> |
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| | | | <p>K71.7 Toxic liver disease with fibrosis and cirrhosis of liver</p> <p>K73 Chronic hepatitis, not elsewhere classified K73.0 Chronic persistent hepatitis, not elsewhere classified K73.1 Chronic lobular hepatitis, not elsewhere classified K73.2 Chronic active hepatitis, not elsewhere classified K73.8 Other chronic hepatitis, not elsewhere classified K73.9 Chronic hepatitis, unspecified</p> <p>K74.0 Hepatic fibrosis K74.1 Hepatic sclerosis K74.2 Hepatic fibrosis with hepatic sclerosis K74.3 Primary biliary cirrhosis, Chronic nonsuppurative destructive cholangitis K74.4 Secondary biliary cirrhosis K74.5 Biliary cirrhosis, unspecified K74.6 Other and unspecified cirrhosis of liver K74.60 Unspecified cirrhosis of liver K74.69 Other cirrhosis of liver, including Cryptogenic, Macronodular, Micronodular, Mixed type, Portal, Postnecrotic K75.3 Granulomatous hepatitis, not elsewhere classified K75.4 Autoimmune hepatitis, Lupoid hepatitis NEC K75.8 Other specified inflammatory liver diseases (not including 75.81 NASH) K75.89 Other specified inflammatory liver diseases K75.9 Inflammatory liver disease, unspecified K76.1 Chronic passive congestion of liver, Cardiac cirrhosis Cardiac sclerosis K76.2 Central hemorrhagic necrosis of liver K76.3 Infarction of liver K76.4 Peliosis hepatis, Hepatic angiomatosis K76.5 Hepatic veno-occlusive disease K76.6 Portal hypertension K76.7 Hepatorenal syndrome K76.8 Other specified diseases of liver K76.81 Hepatopulmonary syndrome K76.89 Other specified diseases of liver, Cyst (simple) of liver, Focal nodular hyperplasia of liver Hepatoptosis K76.9 Liver disease, unspecified K77 Liver disorders in diseases classified elsewhere K83.0 Cholangitis without liver abscess (captures primary sclerosing cholangitis)</p> |
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| | | | <p>B18.0/1 Chronic viral hepatitis B with/without delta-agent B18.2 Chronic viral hepatitis C B18.8 Other chronic viral hepatitis B18.9 Chronic viral hepatitis, unspecified B19 Unspecified viral hepatitis</p> <p>B19.0 Unspecified viral hepatitis with hepatic coma B19.1 Unspecified viral hepatitis B B19.10 Unspecified viral hepatitis B without hepatic coma, Unspecified viral hepatitis B NOS B19.11 Unspecified viral hepatitis B with hepatic coma B19.2 Unspecified viral hepatitis C B19.20 Unspecified viral hepatitis C without hepatic coma, Viral hepatitis C NOS B19.21 Unspecified viral hepatitis C with hepatic coma B19.9 Unspecified viral hepatitis without hepatic coma, Viral hepatitis NOS</p> <p>E83.01 Wilson's disease E83.11 Hemochromatosis E83.110 Hereditary hemochromatosis: Bronzed diabetes, Pigmentary cirrhosis (of liver), Primary (hereditary) hemochromatosis E83.111 Hemochromatosis due to repeated red blood cell transfusions: Iron overload due to repeated red blood cell transfusions, Transfusion (red blood cell) associated hemochromatosis E83.118 Other hemochromatosis E83.119 Hemochromatosis, unspecified</p> <p>O98.4x Viral hepatitis complicating pregnancy, childbirth and the puerperium I82.0 Budd-chiari syndrome E88.01 alpha 1 antitrypsin deficiency</p> |
| Exclusions: | | | |
| Alcohol abuse/disorders (not including alcoholic liver disease which is | 291 291.[01234589] 291.8[129] 303 303.0 303.0[0123] | F10.1 F10.1[024589] F10.12[019] F10.15[019] F10.18[0128] F10.2 | Discharge records with NAFLD code(s) as well as any alcohol abuse/disorder codes were excluded from the analysis given inability to distinguish alcohol induced fatty liver disease from NAFLD. This excluded n=45 from the NAFLD group. ICD-9 Code Descriptions |

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| <p>captured as "Other CLD)</p> | <p>303.9 303.9[0123] V11.3 305 305.[0123] 357.5 425.5 535.3 535.3[01] 655.4[013] 760.71 790.3 980.[012389]</p> | <p>F10.2[012] F10.22[019] F10.2[3456789] F10.23[0129] F10.25[019] F10.28[0128] F10.9 F10.9[2459] F10.92[019] F10.95[019] F10.9[678] F10.98[0128] G62.1 I42.6 K29.2 K29.2[01] G31.2 G72.1 Q86.0 O35.4XX[0123459] K85.2 K86.0</p> | <p>Alcohol-induced mental disorders Alcohol withdrawal delirium Alcohol-induced persisting amnesic disorder Alcohol-induced persisting dementia Alcohol-induced psychotic disorder with hallucinations Idiosyncratic alcohol intoxication Alcohol-induced psychotic disorder with delusions Other specified alcohol-induced mental disorders Alcohol withdrawal Alcohol-induced sleep disorder Other alcoholic psychosis Unspecified alcohol-induced mental disorders Alcohol dependence syndrome Acute alcoholic intoxication Other and unspecified alcohol dependence Alcoholism Alcohol abuse Drunkenness NOS Excessive drinking of alcohol NOS "Hangover" (alcohol) Inebriety NOS Alcoholic polyneuropathy Alcoholic cardiomyopathy Alcoholic gastritis Alcohol affecting fetus or newborn via placenta or breast milk Excessive blood level of alcohol/Elevated blood-alcohol Ethyl alcohol/Denatured alcohol/Ethanol/Grain alcohol Methyl alcohol/Methanol/Wood alcohol Isopropyl alcohol/Dimethyl carbinol/Isopropanol/Rubbing alcohol Fusel oil, Alcohol: amyl/butyl/propyl Other specified alcohols Unspecified alcohol</p> |
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| | | | <p>ICD-10 Code Descriptions</p> <p>Alcohol abuse Alcohol dependence Alcohol use, unspecified Alcoholic polyneuropathy Alcoholic cardiomyopathy Alcoholic gastritis Degeneration of nervous system due to alcohol Alcoholic myopathy Fetal alcohol syndrome (dysmorphic) Maternal care for (suspected) damage to fetus from alcohol Alcohol-induced acute pancreatitis Alcohol-induced chronic pancreatitis</p> |
| Acute Liver Diseases | 573.1 573.2 573.3 070.0 070.1 070.41 070.43 070.51 070.53 | K71.0 K71.1 K71.10 K71.11 K71.2 K71.6 K71.8 K71.9 K72.0 K72.00 K72.01 K72.9 K72.90 K72.91 K75.2 B15 B15.0 B15.9 | <p>Excludes n=2110 for acute liver disease. This is a weighted sample size based on the logistic regression analysis for 2012-2016; Exclusion applied after excluding male patients, female patients under age 18, or those without pregnancy event after 20 weeks gestation.</p> <p>ICD-9 Code Descriptions</p> <p>573.1 Hepatitis in viral diseases classified elsewhere (Coxsackie virus disease (074.8), cytomegalic inclusion virus disease (078.5), infectious mononucleosis (075), but does not include hepatitis (in): mumps (072.71), viral (070.0-070.9), yellow fever (060.0-060.9))</p> <p>573.2 Hepatitis in other infectious diseases classified elsewhere (Does not include hepatitis in: late syphilis (095.3), secondary syphilis (091.62), toxoplasmosis (130.5))</p> <p>573.3 Hepatitis, unspecified; Toxic (noninfectious) hepatitis</p> <p>070.0, 070.1 Viral hepatitis A with/ without mention of hepatic coma</p> <p>070.41 Acute hepatitis C with hepatic coma 070.51 Acute hepatitis C without mention of hepatic coma</p> <p>070.53 Hepatitis E without mention of hepatic coma</p> |

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| | | <p>B16 B16.0 B16.1 B16.2 B16.9</p> <p>B17 B17.0 B17.1 B17.10 B17.11 B17.2 B17.8 B17.9</p> | <p>070.43 Hepatitis E with hepatic coma (chronic versus acute hepatitis E not specified with ICD-9, thus excluded all hepatitis E as most reflect acute cases)</p> <p>ICD-10 Code Descriptions</p> <p>K71.0 Toxic liver disease with cholestasis K71.1 Toxic liver disease with hepatic necrosis K71.10 Toxic liver disease with hepatic necrosis, without coma K71.11 Toxic liver disease with hepatic necrosis, with coma K71.2 Toxic liver disease with acute hepatitis K71.6 Toxic liver disease with hepatitis, not elsewhere classified K71.8 Toxic liver disease with other disorders of liver K71.9 Toxic liver disease, unspecified</p> <p>K72.0 Acute and subacute hepatic failure K72.00 Acute and subacute hepatic failure without coma K72.01 Acute and subacute hepatic failure with coma</p> <p>K72.9 Hepatic failure, unspecified K72.90 Hepatic failure, unspecified without coma K72.91 Hepatic failure, unspecified with coma; Hepatic coma NOS</p> <p>K75.2 Nonspecific reactive hepatitis</p> <p>B15 Acute hepatitis A B15.0 Hepatitis A with hepatic coma B15.9 Hepatitis A without hepatic coma; Hepatitis A (acute)(viral) NOS</p> <p>B16 Acute hepatitis B B16.0 Acute hepatitis B with delta-agent with hepatic coma B16.1 Acute hepatitis B with delta-agent without hepatic coma B16.2 Acute hepatitis B without delta-agent with hepatic coma B16.9 Acute hepatitis B without delta-agent and without hepatic coma; Hepatitis B (acute) (viral) NOS</p> <p>B17 Other acute viral hepatitis</p> |
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| | | | <p>B17.0 Acute delta-(super) infection of hepatitis B carrier</p> <p>B17.1 Acute hepatitis C</p> <p>B17.10 Acute hepatitis C without hepatic coma; Acute hepatitis C NOS</p> <p>B17.11 Acute hepatitis C with hepatic coma</p> <p>B17.2 Acute hepatitis E</p> <p>B17.8 Other specified acute viral hepatitis; Hepatitis non-A non-B (acute) (viral) NEC</p> <p>B17.9 Acute viral hepatitis, unspecified; Acute hepatitis NOS</p> |
| Pregnancy Definitions | | | <p>Discharge and procedure codes used to identify pregnancy records. To avoid double counting records for same pregnancy, only codes indicating an end of pregnancy event were searched. Non-natural causes of pregnancy termination were excluded, as were miscarriages and spontaneous or missed abortions as may occur prior to 20 weeks of gestation.</p> |
| Pregnancy Inclusion Codes | <p>Discharge Codes</p> <p>632</p> <p>634.[0-9][012]</p> <p>640.[09]1</p> <p>641.[012389]1</p> <p>642.[012345679][12]</p> <p>]</p> <p>643.[01289]1</p> <p>644.21</p> <p>645.[12]1</p> <p>646.[0123456789]1</p> <p>646.[124568]2</p> <p>647.[012345689][12]</p> <p>]</p> <p>648.[0123456789][12]</p> <p>]</p> <p>649.[012345678]1</p> <p>649.[0123468]2</p> <p>650</p> <p>651.[0123456789]1</p> <p>652.[0123456789]1</p> <p>653.[0123456789]1</p> <p>654.[0123456789]1</p> <p>654.[013456789]2</p> <p>655.[0123456789]1</p> | <p>Discharge Codes:</p> <p>O60.10X[0123459]</p> <p>O60.12X[0123459]</p> <p>O60.13X[0123459]</p> <p>O60.14X[0123459]</p> <p>O60.2</p> <p>O60.20</p> <p>O60.20X[0123459]</p> <p>O60.22</p> <p>O60.22X[0123459]</p> <p>O60.23</p> <p>O60.23X[0123459]</p> <p>Z37</p> <p>Z37.[012345679]</p> <p>Z37.5[012349]</p> <p>Z37.6[012349]</p> <p>Procedure Codes:</p> <p>0W8NXZZ</p> <p>10D00Z[012]</p> <p>10D07Z[34568]</p> <p>10S07ZZ</p> | <p>Discharge Codes:</p> <p>Preterm labor with preterm delivery</p> <p>Term delivery with preterm labor</p> <p>Outcome of delivery indicator</p> <p>Procedure Codes:</p> <p>Low/Mid/High forceps operation, Outlet forceps operation</p> <p>Forceps rotation of fetal head: DeLee maneuver, Key-in-lock rotation, Kielland rotation, Scanzoni's maneuver;</p> <p>Breech extraction</p> <p>Partial breech extraction with forceps to aftercoming head</p> <p>Other partial breech extraction</p> <p>Total breech extraction with forceps to aftercoming head</p> <p>Other total breech extraction</p> <p>Forceps application to aftercoming head, Piper forceps operation.</p> <p>Vacuum extraction</p> <p>Other instrumental delivery</p> <p>Cesarean section</p> <p>Other cesarean section of unspecified type: Cesarean section NOS, Obstetrical abdominouterotomy, Obstetrical hysterotomy</p> |

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| | <p>656.[012356789]1 656.4[013] 657.01 658.[0123489]1 659.[0123456789]1 660.[0123456789]1 661.[012349]1 662.[0123]1 663.[012345689]1 664.[012345689]1 665.[013456789]1 665.[2789]2 666.[0123]2 667.[01]2 668.[01289][12] 669.[012456789]1 669.[0123489]2 670.[01238]2 671.[0123589]1 671.[0124589]2 672.02 673.[01238]1 673.[01238]2 674.[05]1 674.[01234589]2 675.[01289]1 675.[01289]2 676.[012345689]1 676.[012345689]2 678.[01]1 679.[01]1 679.[01]2 V27.[012345679]</p> <p>Procedure Codes:</p> <p>72.[0123456789] 72.2[19]</p> | | |
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| | 72.3[19] 72.5[1234] 72.7[19] 74.[01249] 74.99 | | |
| Pregnancy Exclusion Codes | <p>Discharge Codes:</p> <p>Pregnant with non-natural termination:</p> 630 631 631.[08] 633 633.0 633.0[01] 633.1 633.1[01] 633.2 633.2[01] 633.8 633.8[01] 633.9 633.9[01] 635.[012345679][012] 636.[012345679][012] 637.[012345679][012] 638 638.[0123456789] <p>Miscarriage or spontaneous/misssed abortion:</p> | <p>Discharge Codes:</p> <p>Pregnant with non-natural termination:</p> 000 000.[01289] 001 001.[019] 002 002[089] 002.8 002.8[19] 002.9 004.8 004.8[09] 007 <p>Miscarriage or spontaneous/missed abortion:</p> 002.1 003 003.[012] 003.3 003.3[0123456789] 003.[45678] 003.8[0123456789] 003.9 <p>Procedure Codes:</p> | <p>This excludes n=156,690. Exclusion applied after excluding male patients, female patients under age 18, or those without pregnancy event after 20 weeks gestation.</p> <p>Discharge Codes:</p> <p>Ectopic pregnancy Hydatidiform mole Other abnormal products of conception (Induced) termination of pregnancy Failed attempted termination of pregnancy Miscarriage or spontaneous/missed abortion</p> <p>Procedure Codes:</p> <p>Dilation and curettage for termination of pregnancy Aspiration curettage of uterus for termination of pregnancy, Therapeutic abortion NOS Removal of extratubal ectopic pregnancy Hysterotomy to terminate pregnancy, Therapeutic abortion by hysterotomy Intra-amniotic injection for abortion</p> |

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| | 634.[0123456789][012] Procedure Codes: Non-naturally terminated 69.01 69.51 74.3 74.91 75.0 | Non-naturally terminated 10A0[034]ZZ 10A07Z6 10A07ZX 10A07ZZ 10A08ZZ 10T2[034]ZZ | |
| Study Outcomes | | | |
| Hypertensive complication (pre-eclampsia, eclampsia, or HELLP syndrome) | 642.4x 642.7x 642.5x 642.6x | O14.00 O14.90 O14.0[23] O14.9[23] O15.2 O11.9 O11.[123] O15.2 O14.10 O14.20 O14.1[23] O14.2[23] O15.00 O15.9 O15.0[23] O15.1 O15.2 | Mild or unspecified pre-eclampsia Mild to moderate pre-eclampsia, unspecified trimester Unspecified pre-eclampsia, unspecified trimester Mild to moderate pre-eclampsia, [second/third] trimester Unspecified pre-eclampsia, [second/third] trimester Eclampsia in the puerperium Pre-eclampsia or eclampsia superimposed on pre-existing hypertension Pre-existing hypertension with pre-eclampsia, unspecified trimester Pre-existing hypertension with pre-eclampsia, [first/second/third] trimester Eclampsia in the puerperium Severe pre-eclampsia/HELLP Severe pre-eclampsia, unspecified trimester HELLP syndrome (HELLP), unspecified trimester Severe pre-eclampsia, [second/third] trimester HELLP syndrome (HELLP), [second/third] trimester Eclampsia Eclampsia in pregnancy, unspecified trimester Eclampsia, unspecified as to time period Eclampsia in pregnancy, [second/third] trimester Eclampsia in labor Eclampsia in the puerperium |

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| Postpartum hemorrhage | 666.0[024] 666.1[024] 666.2[024] 666.3[024] | O72.[0123] | |
| Pre-term birth (<37 weeks) | 644.20 644.21 | O60.10xx[0123459] O60.12xx[0123459] O60.13xx[0123459] O60.14xx[0123459] | Codes (644.20, 644.21) each include: Onset (spontaneous) of delivery before 37 completed weeks of gestation Premature labor with onset of delivery before 37 completed weeks of gestation Preterm labor with preterm delivery |
| Fetal growth restriction | 656.5[013] | O36.59[1239] | |
| Large for gestational age | 653.5[013] 656.6[013] | O36.60X[0123459] O36.61X[0123459] O36.62X[0123459] O36.63X[0123459] | |
| Fetal death | V27.1, V27.3, V27.4, V27.6, V27.7, 656.4[013] | Z37.1, Z37.3, Z37.4, Z37.6[012349], Z37.7, O36.4XX[0123459] | Stillborn (at least one, if multiple gestation) Fetal death: NOS, after completion of 22 weeks' gestation, late, Missed delivery |
| Additional Variables | | | |
| Cirrhosis | 571.2 571.5 571.6 | K70.30 K70.31 K71.7 K72.10 K72.11 K74.3 K74.4 K74.5 K74.60 K74.69 | 571.2 Alcoholic cirrhosis of liver: Florid cirrhosis, Laennec's cirrhosis (alcoholic) 571.5 Cirrhosis of liver without mention of alcohol: Cirrhosis of liver: NOS, cryptogenic, macronodular, micronodular, posthepatic, postnecrotic, Healed yellow atrophy (liver), Portal cirrhosis 571.6 Biliary cirrhosis: Chronic nonsuppurative destructive cholangitis, Cirrhosis: cholangitic, cholestatic K70.30 Alcoholic cirrhosis of liver without ascites K70.31 Alcoholic cirrhosis of liver with ascites K71.7 Toxic liver disease with fibrosis and cirrhosis of liver K72.10 Chronic hepatic failure without coma K72.11 Chronic hepatic failure with coma K74.3 Primary biliary cirrhosis, Chronic nonsuppurative destructive cholangitis K74.4 Secondary biliary cirrhosis K74.5 Biliary cirrhosis, unspecified K74.60 Unspecified cirrhosis of liver, Cirrhosis (of liver) NOS |

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| | | | K74.69 Other cirrhosis of liver Cryptogenic cirrhosis (of liver) Macronodular cirrhosis (of liver), Micronodular cirrhosis (of liver) Mixed type cirrhosis (of liver) Portal cirrhosis (of liver) Postnecrotic cirrhosis (of liver) |
| Diabetes, pre-existing | without chronic complications 249.00-249.31, 250.00-250.33, 648.00-648.04 with chronic complications 249.40-249.91, 250.40-250.93 | without chronic complications E08.xx E09.xx E10.xx E11.xx E13.xx O24.[01389]xx with chronic complications E08.[234568]xxx E09.[234568]xxx E10.[234568]xxx E11.[234568]xxx E13.[234568]xxx | ICD-9 Codes based on this source, with minor modification to remove codes specifically for fetal records: https://www.hcup-us.ahrq.gov/toolssoftware/comorbidity/Table2-FY12-V3_7.pdf ICD-10 Codes based on this source, with minor modification to remove codes specifically for fetal records: https://www.hcup-us.ahrq.gov/toolssoftware/comorbidityicd10/comformat_icd10cm_2019_1.txt |
| Hypertension, pre-existing | 401.0 401.1 401.9 405 405.0 405.01 405.09 405.1 405.11 405.19 405.9 405.91 405.99 642.0[0-4] 642.1[0-4] 642.2[0-4] 642.7[0-4] 642.9[0-4] | I10. I15.0 I15.1 I15.2 I15.8 I15.9 O10.011 O10.012 O10.013 O10.019 O10.02 O10.03 O10.411 O10.412 O10.413 O10.419 | ICD-9 Code Descriptions 401 Essential hypertension: Malignant, Benign, Unspecified 405 Secondary hypertension: Malignant (Renovascular, Other), Benign (Renovascular, Other), Unspecified (Renovascular, Other) 642.0 Benign essential hypertension complicating pregnancy, childbirth, and the puerperium 642.1 Hypertension secondary to renal disease, complicating pregnancy, childbirth, and the puerperium 642.2 Other pre-existing hypertension complicating pregnancy, childbirth, and the puerperium 642.7 Pre-eclampsia or eclampsia superimposed on pre-existing hypertension 642.9 Unspecified hypertension complicating pregnancy, childbirth, or the puerperium ICD-10 Code Descriptions Essential (primary) hypertension |

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| | | O10.42 O10.43 O10.911 O10.912 O10.913 O10.919 O10.92 O10.93 O11.9 O11.1 O11.2 O11.3 | Pre-existing essential hypertension complicating pregnancy or childbirth or puerperium Unspecified pre-existing hypertension complicating pregnancy or childbirth or puerperium Renovascular hypertension Hypertension secondary to other renal disorders Pre-existing secondary hypertension complicating pregnancy or childbirth or puerperium Pre-existing hypertension with pre-eclampsia Hypertension secondary to endocrine disorders Other secondary hypertension Secondary hypertension, unspecified |
| Dyslipidemia, pre-existing | 272.0 272.1 272.2 272.4 | E78.0 E78.1 E78.2 E78.4 E78.5 | Pure hypercholesterolemia Pure hyperglyceridemia Mixed hyperlipidemia Other hyperlipidemia Hyperlipidemia, unspecified |
| Obesity, pre-existing | 278.01 278.00 278.03 649.1[01234] 793.91 V85.3[0123456789] V85.4[12345] V85.54 | E66.0[19] E66.[1289] O99.21[012345] R93.9 Z68.3[0123456789] Z68.4[12345] Z68.54 | Morbid (severe) obesity due to excess calories Other obesity due to excess calories Drug-induced obesity Morbid (severe) obesity with alveolar hypoventilation Other obesity Obesity, unspecified Obesity complicating pregnancy Obesity complicating childbirth Obesity complicating the puerperium Diagnostic imaging inconclusive due to excess body fat of patient Body mass index (BMI) 30.0 or greater, adult Body mass index (BMI) pediatric, greater than or equal to 95th percentile for age |
| Multiple gestation | V27.2 V27.3 V27.4 V27.5 V27.6 V27.7 | Z37.2 Z37.3 Z37.4 Z37.50 Z37.5[12349] Z37.6[012349] | Twins, both liveborn Twins, one liveborn and one stillborn Twins, both stillborn Multiple births, unspecified, all liveborn Triplets/Quadruplets/Quintuplets/Sextuplets/Other multiple births, all liveborn Triplets/Quadruplets/Quintuplets/Sextuplets/Other multiple births, some liveborn |

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| | | Z37.7 | Other multiple births, all stillborn |
| Gestational diabetes mellitus | 648.8[01234] | O99.81[045] O24.4, O24.41, O24.41[049] O24.42, O24.42[049] O24.43, O24.43[049] | Abnormal glucose tolerance; Includes Gestational diabetes Abnormal glucose complicating pregnancy, childbirth and the puerperium |
| Mode of delivery: Cesarean section* Vaginal birth | 765, 766 [767/768, 774/775] | 783, 784, 785 786, 787, 788 [768, 796, 797, 798, 805, 806, 807] | ICD-9 DRG Codes, V34, https://www.cms.gov/icd10manual/version34-fullcode-cms/fullcode_cms/P0372.html CESAREAN SECTION WITH/WITHOUT CC/MCC [VAGINAL DELIVERY WITH STERILIZATION AND/OR D&C, VAGINAL DELIVERY WITH O.R. PROCEDURE EXCEPT STERILIZATION AND/OR D&C, VAGINAL DELIVERY WITH/WITHOUT COMPLICATING DIAGNOSES] ICD-10 DRG Codes, V36 (2019), https://www.cms.gov/ICD10Manual/version36-fullcode-cms/fullcode_cms/P0370.html CESAREAN SECTION WITH/WITHOUT STERILIZATION WITH/WITHOUT CC/MCC [VAGINAL DELIVERY WITH O.R. PROC EXCEPT STERIL &/OR D&C VAGINAL DELIVERY WITH STERILIZATION/D&C WITH/WITHOUT CC/MCC VAGINAL DELIVERY WITHOUT STERILIZATION/D&C WITH/WITHOUT CC/MCC] |

* DRG = Diagnosis Related Group. DRGs comprise a patient classification system that categorizes patients into groups that are clinically coherent and homogeneous with respect to resource use. DRGs group patients according to diagnosis, type of treatment (procedures), age, and other relevant criteria. Each hospital stay has one DRG assigned to it. Reference: Healthcare Cost and Utilization Project (HCUP) Statistical Briefs [Internet]. Hospitalizations Related to Diabetes in Pregnancy, 2008 Statistical Brief #102; Lauren M Wier, MPH, Eva Witt, BA, Jackie Burgess, MBA, and Anne Elixhauser, PhD. Published: December 2010.

Supplemental Table 2. Association of NAFLD with Adverse Maternal and Perinatal Outcomes, Further Adjusted for Gestational Diabetes

| | NAFLD vs Other CLD | | NAFLD vs No CLD | |
|--|-------------------------|-----------------|---------------------------|-----------------|
| | AOR*, 95% CI | p value | AOR*, 95% CI | p value |
| Maternal Outcomes | | | | |
| Hypertensive complications (pre-eclampsia, eclampsia, and/or HELLP syndrome) | 2.93 (2.41-3.56) | <.001 | 2.96 (2.47-3.55) | <.001 |
| Postpartum hemorrhage | 1.18 (0.91-1.54) | .22 | 1.65 (1.27-2.14) | <.001 |
| Maternal death [†] | 3.82 (0.37-39.33) | .26 | 17.9 (2.12-150.81) | .008 |
| Perinatal Outcomes | | | | |
| Pre-term birth (<37 weeks) | 1.00 (0.78-1.27) | .99 | 1.56 (1.24-1.97) | <.001 |
| Fetal growth restriction | 0.42 (0.25-0.7) | .001 | 0.73 (0.44-1.21) | .22 |
| Large for gestational age | 1.70 (1.26-2.29) | <.001 | 1.05 (0.79-1.38) | .75 |
| Fetal death | 0.71 (0.36-1.39) | .32 | 0.99 (0.51-1.92) | .98 |

Abbreviations: nonalcoholic fatty liver disease (NAFLD), chronic liver disease (CLD), hemolysis, elevated liver tests, low platelets (HELLP) *Adjusted odds ratios (AORs) and confidence intervals (CIs) were computed for each study outcome using logistic regression and adjusted for age, race, multiple gestation, pre-existing diabetes, hypertension, dyslipidemia, obesity, and gestational diabetes; N= 17,263,795 for all models except maternal death (17,260,870 for maternal death model) of available 18,574,225

[†]Reflects 5 deaths in NAFLD group, 35 deaths in other CLD group, and 920 deaths in no CLD group.

Supplemental Table 3. Association of NAFLD with Adverse Maternal and Perinatal Outcomes Excluding Pregnancies with Pre-existing Diabetes

| | NAFLD vs non-NAFLD CLD | | NAFLD vs no CLD | |
|---|-------------------------|-----------------|-------------------------|-----------------|
| | AOR*, 95% CI | p value | AOR*, 95% CI | p value |
| Maternal Outcomes | | | | |
| Hypertensive complication (pre-eclampsia, eclampsia, and/or HELLP syndrome) | 3.46 (2.79-4.21) | <.001 | 3.43 (2.83-4.16) | <.001 |
| Postpartum hemorrhage | 1.20 (0.91-1.59) | .21 | 1.68 (1.28-2.21) | <.001 |
| Maternal death [†] | 4.88 (0.46-51) | .19 | 24.16 (2.82-207) | .004 |
| Perinatal Outcomes | | | | |
| Pre-term birth (<37 weeks) | 1.21 (0.94-1.56) | .14 | 1.91 (1.50-2.44) | <.001 |
| Fetal growth restriction | 0.45 (0.26-0.77) | .003 | 0.78 (0.46-1.32) | .36 |
| Large for gestational age | 1.95 (1.40-2.70) | <.001 | 1.21 (0.89-1.64) | .23 |
| Fetal death | 0.63 (0.28-1.44) | .27 | 0.89 (0.40-2.00) | .78 |

*Abbreviations: nonalcoholic fatty liver disease (NAFLD), chronic liver disease (CLD), hemolysis, elevated liver tests, low platelets (HELLP). *Adjusted odds ratios (AORs) and confidence intervals (CIs) were computed for each study outcome using logistic regression and adjusted for age, race, multiple gestation, pre-existing hypertension, dyslipidemia, obesity; n= 17,075,950 for all models except maternal death (17,073,050 for maternal death model). † Reflects 5 deaths in NAFLD group, 35 deaths in other CLD group, and 855 deaths in no CLD group.*

Supplemental Table 4. Association of NAFLD with Adverse Maternal and Perinatal Outcomes Restricted to Use of ICD-9

| | NAFLD vs non-NAFLD CLD | | NAFLD vs no CLD | |
|---|-------------------------|-----------------|-------------------------|-----------------|
| | AOR*, 95% CI | p value | AOR*, 95% CI | p value |
| Maternal Outcomes | | | | |
| Hypertensive complication (pre-eclampsia, eclampsia, and/or HELLP syndrome) | 4.36 (3.47-5.48) | <.001 | 4.44 (3.60-5.48) | <.001 |
| Postpartum hemorrhage | 1.35 (0.98-1.87) | .07 | 1.88 (1.36-2.58) | <.001 |
| Maternal death [†] | 10.09 (0.76-135) | .08 | 33.27 (3.69-300) | .002 |
| Fetal Outcomes | | | | |
| Pre-term birth (<37 weeks) | 1.32 (1.04-1.69) | .03 | 2.23 (1.77-2.82) | <.001 |
| Fetal growth restriction | 0.49 (0.29-0.81) | .006 | 0.89 (0.54-1.48) | 0.65 |
| Large for gestational age | 2.20 (1.55-3.14) | <.001 | 1.41 (1.02-1.96) | 0.04 |
| Fetal death | 0.55 (0.20-1.49) | .24 | 0.82 (0.30-2.19) | 0.69 |

Abbreviations: nonalcoholic fatty liver disease (NAFLD), chronic liver disease (CLD), hemolysis, elevated liver tests, low platelets (HELLP). *Adjusted odds ratios (AORs) and confidence intervals (CIs) were computed for each study outcome using logistic regression and adjusted for age, race, multiple gestation, pre-existing diabetes, hypertension, dyslipidemia, and obesity; n= 12,936,084 for all models except maternal death (12,935,244 for maternal death model). [†] Reflects 5 deaths in NAFLD group, 20 deaths in other CLD group, and 680 deaths in no CLD group.

Supplemental Table 5. Association of NAFLD with Adverse Maternal and Perinatal Outcomes Excluding Pregnancies with Pre-existing Diabetes, Dyslipidemia, or Obesity from the No CLD Group.

| | NAFLD vs no CLD | |
|---|-------------------------|-----------------|
| | AOR*, 95% CI | p value |
| Hypertensive complication (pre-eclampsia, eclampsia, and/or HELLP syndrome) | 3.87 (3.09-4.86) | <.001 |
| Postpartum hemorrhage | 1.76 (1.31-2.36) | <.001 |
| Maternal death [†] | 53.66 (7.3-394) | <.001 |
| Pre-term birth (<37 weeks) | 2.00 (1.55-2.57) | <.001 |
| Fetal growth restriction | 0.95 (0.57-1.59) | 0.85 |
| Large for gestational age | 1.08 (0.75-1.55) | 0.68 |
| Fetal death | 1.02 (0.51-2.05) | 0.95 |

Abbreviations: nonalcoholic fatty liver disease (NAFLD), chronic liver disease (CLD), hemolysis, elevated liver tests, low platelets (HELLP). *Adjusted odds ratios (AORs) and confidence intervals (CIs) were computed for each study outcome using logistic regression and adjusted for age, race, multiple gestation, pre-existing diabetes, hypertension, dyslipidemia, and obesity; N= 17,263,795 for all models except maternal death (17,260,870 for maternal death model) of available 18,574,225. † Reflects 5 deaths in NAFLD group, 35 deaths in non-NAFLD CLD group and 920 deaths in non-CLD group.

Supplemental Figure 1. Temporal Trends in non-NAFLD Chronic Liver Disease Prevalence in Pregnancy (2007-2016).
P-value < 0.001 (test of trend).

