Supplementary file 3 Additional tables

1 Table S3.1 Quality checking for included studies

Author, year	Score[1]	Quality[2]
Bravo et al, 2018 (1)	10.5	Moderate
Carville et al, 2018 (2)	14	High
Chen et al, 2016 (3)	15	Moderate
Chinnaratha et al, 2016 (4)	15	High
Clark et al, 2015 (5)	16	High
Clèries et al, 2014 (6)	12	Moderate
Cocker et al, 2019 (7)	13	Moderate
Cooter et al, 2015 (8)	13.5	Moderate
Dryden-Peterson et al, 2015 (9)	13.5	Moderate
Gao et al, 2012 (10)	12.5	Moderate
Hung et al, 2015 (11)	14.5	High
Ito et al, 2011 (12)	12.5	Moderate
Jung et al, 2015 (13)	12.5	Moderate
Kamsa-ard et al, 2011 (14)	13	Moderate
Katanoda et al, 2015 (15)	13	Moderate
Kim et al, 2019 (16)	11	Moderate
Lepage et al, 2008 (17)	11.5	Moderate
Li et al, 2017 (18)	13.5	Moderate
Li et al, 2018 (19)	14	Moderate
Liu et al. 2019 (20)	13	Moderate
Lorenzoni et al, 2015 (21)	13	High
Medina et al, 2010 (22)	13	Moderate
Melkonian et al, 2018 (23)	14.5	High
Mutyaba et al, 2015 (24)	13	Moderate
Njei et al, 2015 (25)	15.5	High
Patel and Benipal, 2019 (26)	13	Moderate
Pham et al, 2018 (27)	12.5	Moderate
Pocobelli et al, 2008 (28)	13.5	Moderate
Polednak, 2013 (29)	13	Moderate
Ramirez et al, 2014 (30)	14	Moderate
Rich et al, 2019 (31)	14	High
Saha et al, 2016 (32)	14	High

Author, year	**Score[1]**	**Quality[2]**
Shamseddine et al, 2014 (33)	13	Moderate
Shiels et al, 2019 (34)	14	High
Shin et al, 2010 (35)	11.5	Moderate
Siegel et al, 2015 (36)	14	High
Sighoko et al, 2011 (37)	13.5	Moderate
Song et al, 2008 (38)	13.5	Moderate
Sung et al, 2019 (39)	14	High
Tanaka et al, 2008 (40)	13.5	Moderate
Thein et al, 2011 (41)	13	Moderate
Torre et al, 2016 (42)	12.5	Moderate
Van Dyke et al, 2019 (43)	14	High
Wallace et al, 2018 (44)	14	High
Wang et al, 2011 (45)	12	Moderate
Wang et al, 2019 (46)	15.5	High
Ward et al, 2019 (47)	14.5	High
White et al, 2017 (48)	15	High
Witjes et al, 2012a (49)	14	High
Witjes et al, 2012b (50)	13	High
Xu et al, 2017 (51)	14	High
Yeesoonsang et al, 2018 (52)	14	High
Zheng et al, 2018 (53)	11.5	Moderate

1. Average score over scores from two independent reviewers. Please refer to text for further details.
2. Quality categories: High (score14-18), Moderate (score 9-13.5) or Low (score <9); please refer to text for further details.

2 Table S3.2 Summary of included studies on trends in incidence rates for adult liver cancers combined

Author, year	Location	Period	Age-group (years)	Sex	Sample size	Period (trend)	APC (95% CI in brackets)[1,2,3]	Trend[4,5]
All included studies (arranged alphabetically by first author by country within continents; Africa, Americas, Asia, Europe and Oceania)								
Africa								
Dryden-Peterson et al, 2015 (9)	BOS	2003-2008	All	Persons	253	2003-2008	-6.6 (-12.0, -1.0)	Decreased
Sighoko et al, 2011 (37)	GAM	1988-2006	All	Males Females	2,179 796	1988-2006	0.02 (-1.8, 1.9) 3.1 (0.3, 5.8)	Stable Increased
Lorenzoni et al, 2015 (21)	Maputo, MOZ	1991-2008	All	Males Females	NR	1991-2008	-1.6 (-4.0, 0.7) 2.4 (-1.1, 5.8)	Stable Stable
Mutyaba et al, 2015 (24)	Kampala, UGA	1999-2008	All	Persons	481	1999-2008	7.2 (3.1, 11.5)	Increased
Americas								
Melkonian et al, 2018 (23)	USA[6]	1999-2009	All	Persons Males Females	28,592 20,011 8,581	1999-2009	NHW:3.6 (3.0, 4.3); AI/AN 5.0 (2.7, 7.3) NHW:4.0 (3.3, 4.6); AI/AN 4.8 (2.0, 7.8) NHW:2.2 (0.9, 3.6); AI/AN 5.2 (0.8, 9.9)	Increased (NHW, AI/AN) Increased (NHW, AI/AN) Increased (NHW, AI/AN)
Polednak, 2013 (29)	USA[6]	1999-2009	All	Persons	171,783	1999-2009	4.3 (4.1, 4.5)	Increased
Siegel et al, 2015 (36)	USA[7]	2003-2012	All	Males Females	NR	2003-2012	1.8 (NHW), 3.7 (H) (95% CI NR)[8,9] 2.4 (NHW); 3.5 (H) (95% CI NR)[8,9]	Increased (NHW, H) Increased (NHW, H)
Sung et al, 2019 (39)	USA[10,11]	1995-2014	25-29 30-34 35-39 40-44 45-49 50-54 55-59 60-64 65-69 70-74 75-79 80-84	Persons	NR	1995-2014	1.5 (-0.6, 3.6) 1.0 (-0.3, 2.4) -0.2 (-1.2, 0.8) -0.9 (-1.5, -0.2) 0.9 (0.5, 1.3) 5.3 (4.9, 5.6) 7.6 (7.3, 7.9) 6.0 (5.7, 6.3) 3.3 (3.0, 3.6) 2.5 (2.2, 2.8) 2.4 (2.1, 2.7) 2.0 (1.6, 2.5)	Stable Stable Stable Decreased Increased Increased Increased Increased Increased Increased Increased Increased
Torre et al, 2016 (42)	USA[12]	2003-2012	All	Males Females	NR	2003-2012	3.7 (NHW) (95% CI NR)[8,9]-1.7 (AANHPI)[8] 3.5 (NHW) (95% CI NR)[8,9], 1.3 (AANHPI)[8]	Increased (NHW), Stable (AANHPI) Increased (NHW) , Stable (AANHPI)
Ward et al, 2019 (47)	USA[7]	1999-2015	All	Males Females	NR	2011-2015	2.8 (2.1, 3.3) 3.8 (3.5, 4.0)	Increased Increased
Bravo et al, 2018 (1)	COL	2008-2012	All	Males Females	249 218	2008-2012	1.7 (0.9, 2.4) 0.4 (-0.5, 1.2)	Increased Stable
Asia								
Chen et al, 2016 (3)	CHN	2000-2011	All	Males Females	NR	2000-2011 2008-2011	-1.8 (95% CI NR)[8,9] -4.4 (95% CI NR)[8,9]	Decreased Decreased
Li et al, 2017 (18)	GZ, CHN	2004-2015	All	Persons Males Females	27,149 21,865 5,284	2004-2015	-2.3 (-3.5, -1.1) -2.3 (-3.4, -1.1) -2.3 (−4.1, −0.4)	Decreased Decreased Decreased
Li et al, 2018 (19)	SH, CHN	2002-2015	All	Persons (Urban)	NR	2002-2015	-5.0 (-7.0, -3.1)	Decreased

Author, year	Location	Period	Age-group (years)	Sex	Sample size	Period (trend)	APC (95% CI in brackets)[1,2,3]	Trend[4,5]
Liu et al. 2019 (20)	SH, CHN	1988-2013	All	Males Females	NR	1988-2013	-1.9 (95% CI NR)[8,9] -2.3 (95% CI NR)[8,9]	Decreased Decreased
Song et al, 2008 (38)	TJ, CHN	1981-2000	All	Males Females	NR	1981-2000	-1.1 (-1.6, -0.7) -1.2 (-1.9, -0.3)	Decreased Decreased
Wang et al, 2011 (45)	BJ, CHN	1998-2007	All	Males Females	8,820 3,082	1998-2007	0.4 (95% CI NR)[7] -0.8 (95% CI NR)[7]	Stable Stable
Xu et al, 2017 (51)	SZ, CHN	2001-2015	All	Males Females	NR	2001-2015	-1.1 (95% CI NR)[7] -1.7 (95% CI NR)[7]	Stable Stable
Zheng et al, 2018 (53)	CHN	2000-2014	All	Persons	NR	2000-2014	-2.3 (95% CI NR) [8,9]	Decreased
Ito et al, 2011 (12)	Osaka, JPN	1968-2007	All	Persons Males Females	NR	1998-2007	-3.7 (95% CI NR)[8,9] -4.3 (95% CI NR)[8,9] -2.1 (95% CI NR)[8,9]	Decreased Decreased Decreased
Katanoda et al, 2015 (15)	Yamagata, Fukui & Nagasaki, JPN	1985-2010	All	Males Females	NR	1992-2010 1995-2010	-2.2 (-2.7, -1.8) -1.5 (-2.2, -0.9)	Decreased Decreased
Jung et al, 2015 (13)	KOR	1999-2012	All	Persons Males Females	NR	1999-2012	-1.9 (95% CI NR)[8,9] -2.1 (95% CI NR)[8,9] -1.6 (95% CI NR)[8,9]	Decreased Decreased Decreased
Shamseddine et al, 2014 (33)	LEB	2003-2008	All	Males Females	NR	2003-2008	13.6 (95% CI NR)[8,9] 18.3 (95% CI NR)[8,9]	Increased Increased
Medina et al, 2010 (22)	PHL	1983-2002	<75	Males Females	4,177 1,538	1983-2002	-1.0 (-1.7, -0.3) -1.2 (-2.1, -0.3)	Decreased Decreased
Europe								
Cooter et al, 2015 (8)	CYP	1998-2008	All	Males Females	80 35	1998-2008	4.4 (1.3, 8.8) 8.3 (1.5, 15.5)	Increased Increased
Lepage et al, 2008 (17)	FRA	1980-2000	All	Males Females	NR	1980-2000	4.8 (95% CI NR)[8,9] 3.4 (95% CI NR)[8,9]	Increased Increased
Witjes et al, 2012a (49)	NLD	1989-2009	All	Males Females	4,415 2,099	1989-2009	2.1 (1.5, 2.7) 1.0 (0.2, 1.8)	Increased Increased
Clèries et al, 2014 (6)	ESP	1993-2007	All	Males Females	560 229	1993-2007	2.2 (95% CI NR)[8] -0.6 (95% CI NR)[8]	Stable Stable
Oceania								
Cocker et al, 2019 (7)	AUS	1982-2014	All	Persons Males Females	NR	2006-2014 1982-2014 2005-2014	3.7 (2.9, 4.5) 4.6 (4.4, 4.8) 3.0 (4.6, 5.6)	Increased Increased Increased
Additional trends by age-								
Polednak, 2013 (29)	USA[6]	1999-2009	15-34 35-44 45-54 55-64	Persons	2,049 5,714 34,461 45,145	1999-2009	2.0 (–0.2, 4.2) -0.9 (–1.5, -0.3) 5.0 (3.6, 6.4) 8.3 (7.3, 9.3)	Stable Decreased Increased Increased

Author, year	Location	Period	Age-group (years)	Sex	Sample size	Period (trend)	APC (95% CI in brackets)[1,2,3]	Trend[4,5]
			65-74 75-84 85+		40,643 33,668 10,103		2.8 (2.4, 3.2) 3.0 (2.6, 3.4) 1.2 (0.8, 1.6)	Increased Increased Increased
Li et al, 2017 (18)	CHN	2004-2015	0-34 35-54 55-74 75+	Persons	NR	2004-2015	-6.0 (-8.0, -4.0) -2.1 (-3.3, -0.8) -2.5 (-3.8, -1.1) -0.2 (-2.8, 2.6)	Decreased Decreased Decreased Stable
Zheng et al, 2018 (53)	CHN	2000-2014	<40 40-49 50-59 60-69 70-79 80+	Persons	NR	2000-2014	-3.9 (95% CI NR)[8,9] -3.0 (95% CI NR)[8,9] -1.6 (95% CI NR)[8,9] -2.2 (95% CI NR)[8,9] -1.8 (95% CI NR)[8,9] -0.6 (95% CI NR)[8]	Decreased Decreased Decreased Decreased Decreased Stable

AANHPI Asian American, Native Hawaiians & Pacific Islanders; AI/AN American Indians/Alaska Native; APC Annual Percentage Change; AUS Australia; BOS Botswana; BJ Beijing; CHN China; COL Colombia; CYP Cyprus; ESP Spain; FRA France; GAM Gambia; GZ Guangzhou; H Hispanic; JPN Japan; KOR South Korea; LEB Lebanon; MOZ Mozambique; NLD Netherlands; NR Not reported, NHW Non-Hispanic white; PHL Philippines; SH, Shanghai, SZ Shenzhen; TJ Tianjin; UGA Uganda; USA United States

1. Adult liver cancers were defined according to the International Classification of Disease for Oncology, Third Edition (ICD-O-3) or International Classification of Disease, Tenth Edition (ICD-10) site code (C22).
2. Annual percentage change in age-standardized rates determined using JoinPoint regression except for four studies (8, 9, 21, 24) that used Poisson modelling and two studies (17, 39) that used age-period-cohort methods.
3. Trends based on annual percentage change (APC) in age-standardised incidence rate. The APC is the annual increase or decrease in incidence trends over the specified time period.
4. Negative APC values indicate a decreasing trend whereas positive APC values indicate an increasing trend. Stable means that the 95% confidence interval does not include zero.
5. Only incidence trends for most recent time period shown.
6. Based on population-based cancer incidence data from the United States Cancer Statistics registry for all 50 states in the USA and the District of Colombia.
7. Based on population-based cancer incidence data from the North American Association of Central Cancer Registries database for 47 states and the District of Puerto Rico in the USA.
8. Studies did not report the 95% confidence intervals and were not included in the meta-analysis.
9. Findings were significant at 5% level.
10. Based on population-based cancer incidence data from the North American Association of Central Cancer Registries database for 25 states in the USA.
11. Study not included in meta-analysis as trends only reported by smaller age-groups.
12. Based on population-based cancer incidence data from the North American Association of Central Cancer Registries database for 24 states and one metropolitan area (Atlanta) in the USA.

3 Table S3.3 Summary of included studies on trends in incidence rates for adult hepatocellular carcinoma

Author, year	Location	Period	Age-group (years)	Sex	Sample size	Period (trend)	APC (95% CI in brackets)[1,2,3]	Trend[4,5]
All included studies (arranged alphabetically by first author by country within continents; Americas, Asia, Europe and Oceania)								
Americas								
Njei et al, 2015 (25)	USA[6]	1973-2010	All	Persons Males Females	63,297 47,346 15,951	2007-2011 2006-2011 2009-2011	2.7 (0.6, 4.9) 3.5 (95% CI NR)[7] -2.2 (95% CI NR)	Increased Increased Stable
Pham et al, 2018 (27)	CA, USA	1988-2012	All	Males (NHW) Females (NHW)	12,807 4,023	1988-2012 1988-2012	5.3 (4.9, 5.6) 3.8 (3.3, 4.3)	Increased Increased
Ramirez et al, 2014 (30)	TX, USA	1995-2010	All	Persons (NHW)	13,584	1995-2010	5.5 (4.8, 6.2)	Increased
Rich et al, 2019 (31)	USA[8,9]	1992-2015	20+	Persons	51,888	2010-2015	-0.7 (-2.0, 0.7)	Stable
Shiels et al, 2019 (34)	USA[10,11]	2001-2013	66-99	Persons Males Females	15,300 10,262 5,038	2001-2013	3.4 (2.8, 4.0) 3.2 (2.5, 3.8) 3.1 (2.2, 4.1)	Increased Increased Increased
White et al, 2017 (48)	USA[12]	2000-2012	All	Persons Males Females	236,290 172,492 63,798	2000-2012	3.5 (3.3, 3.8) 3.7 (3.3, 4) 2.7 (2.2, 3.2)	Increased Increased Increased
Pocobelli et al, 2008 (28)	CAN	1976-2000	20+	Males Females	NR	1976-2000	3.4 (3.0, 3.8) 2.2 (1.5, 2.8)	Increased Increased
Asia								
Gao et al, 2012 (10)	SH, CHN	1975-2005	25-79	Males Females	35,241 13,931	1975-2005	-1.6 (-1.8, -1.4) -1.8 (-2.0, 1.6)	Decreased Stable
Tanaka et al, 2008 (40)	Osaka, JPN[11]	1981-2003	50-59 60-69 70-79 50-59 60-69 70-79	Males Females 	NR	1996-2003 1995-2003 2000-2003 1991-2003 1997-2003 2000-2003	-3.1 (-4.2, -2.1) -22.3 (-26, -18.6) -12.4 (-35.7, 10.9) -0.9 (-1.1, -0.7) -5.7 (-7.3, -4.1) -7.9 (-18.1, 2.4)	Decreased Decreased Stable Decreased Decreased Stable
Yeesoonsang et al, 2018 (52)	Khon-Kaen, THA	1989-2009 1989-2013	20+	Males Females	1,004 184	2007-2013 1989-2013	-2.8 (-9.8, 4.8) 1.4 (0.1, 2.7)	Stable Increased
Hung et al, 2015 (11)	TWN	2003-2011	All	Persons Males Females	82,856 60,117 22,739	2003-2011	-0.5 (-1.2, 0.2) -0.4 (-1.1, 0.3) -0.2 (-1.1, 0.6)	Stable Stable Stable
Europe								
Witjes et al, 2012a (49)	NLD	1982-2014	15-95	Persons Males Females	5,143 3,738 1,405	1989-2009	0.6 (-0.1, 1.3) 2.2 (1.6, 2.7) 1.0 (-0.01, 2.2)	Stable Increased Stable

Author, year	Location	Period	Age-group (years)	Sex	Sample size	Period (trend)	APC (95% CI in brackets)[1,2,3]	Trend[4,5]
Oceania								
Carville et al, 2018 (2)	VIC, AUS	2004-2013	All	Males Females	1,737 434	2004-2013	8.6 (6.3, 10.9) 8.3 (4.7, 11.9)	Increased Increased
Chinnaratha et al, 2016 (4)	SA, AUS[11]	1996-2010	All	Persons (HBV+)[13]	47	1996-2010	20.8 (10.1, 32.5)	Increased
Clark et al, 2015 (5)	QLD, AUS	1996-2011	All	Males Females	1,315 305	1996-2011	3.5 (2.1, 5.0) 2.6 (-0.7, 6.0)	Increased Stable
Thein et al, 2011 (41)	NSW, AUS[10]	1992-2007	All	Persons (HBV+)[13] Persons (HCV+)[13]	329 446	1992-2007	-3.3 (-8.2, 1.8) -3.3 (-6.3, -0.2)	Stable Decreased
Wallace et al, 2018 (44)	AUS	1982-2013	45+	Persons Males Females	18,575 14,777 3,645	1982-2014	4.5 (4.2, 4.7) 4.3 (4.1, 4.6) 4.2 (3.8, 4.6)	Increased Increased Increased
Additional trends by age								
Ramirez et al, 2014 (30)	TX, USA	1995-2010	50-59 60-69 70-79 80+	Persons (NHW)	NR	1995-2010	12.4 (10.9, 13.9) 4.7 (3.1, 6.3) 2.7 (1.4, 4.1) 2.7 (1.5, 4.0)	Increased Increased Increased Increased
Rich et al, 2019 (31)	USA[8]	1992-2015	40-49 50-59 60-69 70-79 80+	Persons (NHW)	NR	2009-2015 2012-2015 2004-2015 1992-2015 1992-2015	-12.2 (-18.9, -5.1) -9.0 (-15.8, -1.6) 8.7 (7.7, 9.7) 2.6 (2.2, 3.0) 3.2 (2.6, 3.8)	Decreased Decreased Increased Increased Increased
Shiels et al, 2019 (34)	USA[10]	2001-2013	66-75 76-85 86+	Persons	8,006 6,039 1,255	2001-2013	3.2 (2.4, 4.0) 3.9 (3.2, 4.6) 2.8 (0.9, 4.7)	Increased Increased Increased
White et al, 2017 (48)	USA[12]	2000-2012	20-24 25-29 30-34 35-39 40-44 45-49 50-54 55-59 60-64 65-69 70-74 75-79 80-84 85+	Persons	NR	2000-2012	1.0 (-2.8, 5.0) 0.0 (-8.8, 9.6) 1.5 (-0.9, 4.1) -2.7 (-4.4, -1.0) -2.0 (-3.0, -1.0) -1.6 (-3.2, 0.0) 4.4 (2.5, 6.2) 8.9 (7.1, 10.7) 6.4 (4.7, 8.2) 3.1 (2.7, 3.5) 2.2 (1.6, 2.8) 2.1 (1.3, 3.0) 2.6 (1.8, 3.5) 1.8 (1.3, 2.3)	Stable Stable Stable Decreased Decreased Decreased Increased Increased Increased Increased Increased Increased Increased Increased
Hung et al, 2015 (11)	TWN	2003-2011	15-29 30-64 65+	Persons	624 41,503 40,692	2000-2003	-7.9 (-10.0, -5.7) -2.0 (-2.8, -1.1) 1.3 (0.6, 1.9)	Decreased Decreased Increased

Author, year	Location	Period	Age-group (years)	Sex	Sample size	Period (trend)	APC (95% CI in brackets)[1,2,3]	Trend[4,5]
Wallace et al, 2018 (44)	AUS	1982-2014	45-49	Persons	992	1982-2014	2.0 (-2.4, 6.6)	Stable
			50-54		1,808		4.8 (2.8, 6.8)	Increased
			55-59		2,218		4.9 (6.2, 7.4)	Increased
			60-64		2,410		4.1 (2.7, 5.6)	Increased
			65-69		2,706		3.1 (2.3, 4.0)	Increased
			70-74		2,764		4.7 (3.5, 5.9)	Increased
			75-79		2,371		4.3 (3.1, 5.6)	Increased
			80-84		1,495		5.4 (4.6, 6.2)	Increased
			85+		855		4.7 (2.9, 6.5)	Increased
Additional trends by sex & age-group								
Pham et al, 2018 (27)	CA, USA	1988-2012	20-39	Males (NHW)	177	1988-2012	1.4 (-0.4, 3.3)	Stable
			40-49		981		5.1 (2.6, 7.6)	Increased
			50-59		3,776		9.8 (8.8, 10.9)	Increased
			60-69		3,702		5.3 (4.5, 6.1)	Increased
			70+		4,171		3.0 (2.7, 3.4)	Increased
			20-39	Females (NHW)	104		-0.1 (-2.7, 2.6)	Stable
			40-49		236		2.2 (0.4, 3.9)	Increased
			50-59		693		6.0 (4.3, 7.8)	Increased
			60-69		980		3.9 (2.6, 5.2)	Increased
			70+		2,010		3.5 (2.8, 4.3)	Increased
Pocobelli et al, 2008 (28)	CAN	1976-2000	20-49	Males	NR	1976-2000	3.3 (2.3, 4.3)	Increased
			50-64				3.3 (2.7, 3.9)	Increased
			65-74				3.7 (3.2, 4.3)	Increased
			74+				2.6 (2.1, 3.1)	Increased
			20-49	Females			1.1 (-0.01, 2.3)	Stable
			50-64				2.2 (1.3, 3.0)	Increased
			65-74				3.1 (2.1, 4.1)	Increased
			74+				1.5 (0.7, 4.3)	Increased
Witjes et al, 2012a (49)	NLD	1989-2009	<60	Males	1,064	1989-2009	2.9 (1.6, 3.9)	Increased
			60-74		1,763		1.7 (0.8, 2.5)	Increased
			75+		911		2.6 (1.3, 3.8)	Increased
			<60	Females	352		2.6 (0.3, 5.0)	Increased
			60-74		566		0.2 (-1.6, 2.1)	Stable
			75+		487		0.9 (-0.4, 2.3)	Stable
Clark et al, 2015 (5)	QLD, AUS	1996-2011	<50	Males	NR	1996-2011	3.9 (0.4, 7.6)	Increased
			50-69				4.2 (2.0, 6.5)	Increased
			70+				2.1 (0.4, 3.9)	Increased
			<50	Females			2.1 (-6.8, 11.9)	Stable
			50-69				-1.4 (-3.4, 6.5)	Stable
			70+				3.6 (-0.6, 8.0)	Stable

APC Annual Percentage Change; API Asian/Pacific Islander; AUS Australia; CA California; CAN Canada; CHN China; H Hispanic; HBV Hepatitis B virus; HCV Hepatitis C virus; JPN Japan; NLD Netherlands; NR Not reported, NHW Non-Hispanic white; NSW New South Wales; QLD Queensland; SA South Australia; SH Shanghai; THA Thailand; TWN Taiwan; TX Texas; USA United States; VIC Victoria

1. Adult hepatocellular carcinomas (HCC) were defined according to the International Classification of Disease for Oncology, Third Edition (ICD-O-3) site code (C22.0) and histologically as HCC (ICD-O-3 morphology codes M8170-M8175).
2. Annual percentage change in age-standardized rates determined using JoinPoint regression except for three studies (2, 10, 41) that used Poisson modelling and one study (28) that used age-period-cohort methods.
3. Trends based on annual percentage change (APC) in age-standardised incidence rate. The APC is the annual increase or decrease in incidence trends over the specified time period.
4. Negative APC values indicate a decreasing trend whereas positive APC values indicate an increasing trend. Stable means that the 95% confidence interval does not include zero.
5. Only incidence trends for most recent time period shown.
6. Based on population-based cancer incidence data from the Surveillance, Epidemiology and End Results (SEER 18) database covering 11 states and two metropolitan areas in the USA.
7. Findings were significant at 5% level.
8. Based on population-based cancer incidence data from the Surveillance, Epidemiology and End Results (SEER 13) database covering six states and seven regions in the USA.
9. Also gives trends by smaller age group and ethnicity.
10. Based on data from the Surveillance, Epidemiology and End Results/Medicare linked database.
11. Not included in meta-analysis as trends only reported for population sub-groups.
12. Based on population-based cancer incidence data from the United States Cancer Statistics registry for all 50 states and the District of Colombia in the USA.
13. Only people infected with viral hepatitis B (HBV+) or viral hepatitis C (HCV+).

4 Table S3.4 Summary of included studies on trends in incidence rates for intrahepatic cholangiocarcinoma or combined hepatocellular and cholangiocarcinoma

Author, year	Location	Period	Age group (years)	Sex	Sample size	Period (trend)	APC (95% CI in brackets)[1,2,3]	Trend[4,5]
Asia								
Intrahepatic Cholangiocarcinoma[1]								
Americas								
Patel and Benipal, 2019 (26)	USA[6]	2001-2015	0-99	Persons	NR	2010-2015	9.7 (95% CI NR)[7,8]	Increased
Saha et al, 2016 (32)	USA[9]	1973-2012	0-99	Persons	NR	2003-2012	4.4 (3.4, 5.3)	Increased
Van Dyke et al, 2019 (43)	USA[10]	1999-2013	15+	Persons Males Females	37,685 19,438 18,247	1999-2013	3.2 (95% CI NR)[7,8] 2.6 (95% CI NR)[7,8] 3.7 (95% CI NR)[7,8]	Increased Increased Increased
Asia								
Kamsa-ard et al, 2011 (14)	Songkhla, THA[11]	1985-2009	15+	Persons Males Females	10,730 7,419 3,311	2003-2009 2002-2009 2003-2009	-7.5 (-13.5, -1.0) -5.8 (-10.4, -1.0) -8.1 (-14.6, -1.1)	Decreased Decreased Decreased
Kim et al, 2019 (16)	KOR	2006-2015	20+	Persons	34,695	2006-2015	-1.3 (95% CI NR)[7,8]	Decreased
Shin et al, 2010 (35)	KOR	1999-2005	30-89	Males Females	6,489 3,834	1999-2005	7.9 (95% CI NR)[7,8] 10.6 (95% CI NR)[7,8]	Increased Increased
Yeesoonsang et al, 2018 (52)	Khon-Kaen, THA[11]	1989-2013	20+	Males Females	657 363	1989-2013	5.2 (3.8, 6.6) 4.4 (3.1, 5.7)	Increased Increased
Europe								
Witjes et al, 2012b (50)	NLD	1989-2009	15-95	Persons	785	1999-2009	9.4 (4.6, 14.3)	Increased
Additional trends by age								
Van Dyke et al, 2019 (43)	USA[10]	1999-2013	<45 45+	Persons	NR	1999-2013	3.3 (95% CI NR)[7,8] 3.2 (95% CI NR)[7,8]	Increased Increased
Witjes et al, 2012b (50)	NLD	1989-2009	30-44 45-59 60-74 75+	Persons	NR	1989-2009	2.7 (-2.6, 7.9) 3.0 (0.2, 5.8) 0.7 (-2.1, 3.5) 1.8 (-0.7, 4.3)	Stable Increased Stable Stable
Combined Hepatocellular and Cholangiocarcinoma[1]								
Wang et al, 2019 (46)	USA[9]	2000-2014	0-99	Persons Males Females	642 433 209	2000-2014	5.7 (1.6, 10.0) NR	Increased Increased NR

APC Annual Percentage Change; KOR Korea; NLD Netherlands; NR Not reported; THA Thailand; USA United States of America

1. Adult liver cancers were defined according to the International Classification of Disease for Oncology, Third Edition (ICD-O-3) or International Classification of Disease, Tenth Edition (ICD-10) site code (C22) and histologically as cholangiocarcinoma (CHCA, ICD-O-3 site codes C22.1, C24.0), intrahepatic cholangiocarcinoma (ICC, ICD-O-3 site code C22.1, morphology code M8160) or combined hepatocellular-cholangiocarcinoma (cHCC-CC, ICD-O-3 morphology code M8180).
2. Annual percentage change in age-standardized rates determined using JoinPoint regression.
3. Trends based on annual percentage change (APC) in age-standardised incidence rate. The APC is the annual increase or decrease in incidence trends over the specified time period.
4. Negative APC values indicate a decreasing trend whereas positive APC values indicate an increasing trend. Stable means that the 95% confidence interval does not include zero.
5. Only incidence rates and trends for most recent time period shown.
6. Based on data from the United States Cancer Statistics registry which includes population-based cancer incidence data for all 50 states in the United States and the District of Colombia.
7. Studies did not report the 95% confidence intervals and were not included in the meta-analysis.
8. Findings were significant at 5% level.
9. Based on population-based cancer incidence data from the Surveillance, Epidemiology and End Results (SEER 18) database covering 11 states and two metropolitan areas in the USA.
10. Based on population-based cancer incidence data from the North American Association of Central Cancer Registries database for 38 states in the USA.
11. Studies by Kamsa-ard et al, 2011 (14) and Yeesoonsang et al, 2018 (52) includes all cholangiocarcinoma cases (CHCA, ICD-O-3 site codes C22.1, C24.0).

5 Table S3.5 Summary of most recent liver cancer incidence trends for included studies from United States that present additional trend estimates by race/ethnicity

Author, year	Time-period	Sex	Age group (years)[1]	Trends[2,3,4,5] by Race/Ethnicity[6,7] White	NHW	Black	API	AIAN	NHAI/AN	Hispanic	non-Hispanic
Liver cancers combined[8]											
Melkonian et al, 2018 (23)	1999-2009	Persons	All	NR	↑	NR	NR	NR	↑	NR	NR
Siegel et al, 2015 (36)	2003-2012	Males	All	NR	↑	NR	NR	NR	NR	↑	NR
Siegel et al, 2015 (36)	2003-2012	Females	All	NR	↑	NR	NR	NR	NR	↑	NR
Torre et al, 2016 (42)	2003-2012	Males	All	NR	↑	NR	↓	NR	NR	NR	NR
Torre et al, 2016 (42)	2003-2012	Females	All	NR	↑	NR	↔	NR	NR	NR	NR
Ward et al, 2019 (47)	2011-2015	Males	All	↑	NR	↑	↓	↑	NR	↔	↑
Ward et al, 2019 (47)	2011-2015	Females	All	↑	NR	↑	↔	↑	NR	↑	↑
Hepatocellular carcinoma[8]											
Pham et al, 2018 (27)	1988-2012	Males	All	NR	↑	↑	↑	NR	NR	↑	NR
Pham et al, 2018 (27)	1988-2012	Females	All	NR	↑	↑	↑	NR	NR	↑	NR
Ramirez et al, 2014 (30)	1995-2010	Persons	All	NR	↑	NR	NR	NR	NR	↑	NR
Shiels et al, 2019 (34)	2001-2013	Persons	All	↑	NR	↑	↔	NR	NR	↑	NR
White et al, 2017 (48)	2000-2012	Persons	All	↑	NR	↑	↓	↑	NR	↑	NR
Rich et al, 2019 (31)	2009-2015	Persons	30-39	NR	NS	NS	↓	NR	NR	↔	NR
Rich et al, 2019 (31)	2009-2015	Persons	40-59	NR	↓	↓	↓	NR	NR	↓	NR
Rich et al, 2019 (31)	2004-2015	Persons	60-69	NR	↑	↑	↔	NR	NR	↑	NR
Rich et al, 2019 (31)	1992-2015	Persons	70-79	NR	↑	↑	↓	NR	NR	↑	NR
Intrahepatic cholangiocarcinoma[8]											
Van Dyke et al, 2019 (43)	1999-2013	Persons	15+	NR	↑	↑	NR	NR	NR	↑	NR

API Asian/Pacific Islander; AI/AN American Indian/Alaska Native; H Hispanic; NHAI/AN non-Hispanic American Indian/Alaska Native; NHW non-Hispanic White; NR not reported; NS not stated;

1. Only age groups for which incidence trends were reported are presented. Hence for some studies, only certain age groups are shown.
2. Trends based on annual percentage change (APC) in age-standardised incidence rate. The APC is the annual increase or decrease in incidence trends over the specified time period.
3. Negative APC values indicate a decreasing trend whereas positive APC values indicate an increasing trend. Stable means that the 95% confidence interval does not include zero.
4. Increasing trends indicated by red arrow; Decreasing by green arrow and stable trends by blue arrow.
5. Only incidence trends for most recent time period shown.
6. Race categories are not mutually exclusive from Hispanic origin unless specially stated as non-Hispanic white, non-Hispanic Asian/Pacific Islander or non-Hispanic American Indian/Alaska Native
7. Data for specified racial or ethnic populations other than whites and Blacks should be interpreted cautiously.
8. Adult liver cancers were defined according to the International Classification of Disease for Oncology, Third Edition (ICD-O-3) or International Classification of Disease, Tenth Edition (ICD-10) site code (C22) and histologically as hepatocellular carcinoma (HCC) (ICD-O-3 site code C22.0, morphology codes M8170-M8175) or intrahepatic cholangiocarcinoma (ICC, C22.1, M8170).

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