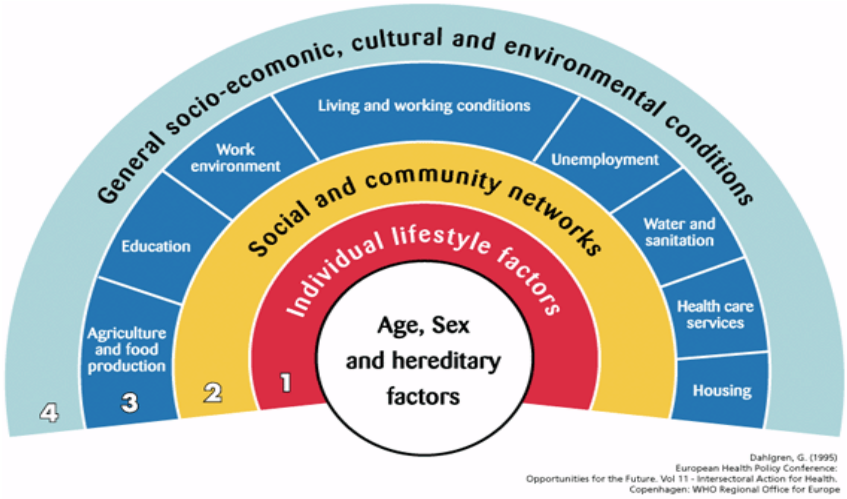
Supplementary material

Figure S1. Dahlgren & Whitehead (1991) model of the determinants of health [13]



6 # Table S1. Search strategy (Embase example)

	Search Terms	Results
1	exp meningococcosis/ or exp meningitis/	116492
2	(((meningococcal or meningococcic or meningococcus or meningitidis) adj2 (disease$ or infection$ or meningitis or septic or sepsis or septic?emia or macteremia)) or meningococc?emia or (meningitis not viral$)).ti,ab.	64378
3	1 and 2	51749
4	((cryptococcal or cryptococcosis or cryptococcus or tuberculous or tuberculosis or tubercular or pneumococcal) adj2 meningitis).ti,ab.	10652
5	3 not 4	42684
6	exp sex factor/	13238
7	(sex-based or sex-related).ti,ab.	12917
8	((sex or sex) adj2 (analysis or specific or difference? or factor? or inequit$ or disparit$ or inequalit$)).ti,ab.	190304
9	exp geriatrics/	40052
10	((ethnic$ or race or racial or religio$ or cultur$ or minorit$ or refugee or indigenous or aboriginal) adj3 (analysis or difference$ or specific or disparit$ or inequalit$ or inequit$)).ti,ab.	108129
11	((poverty or low-income or socioeconomic$ or social or structural conflict) adj2 (analysis or disadvantage$ or specific or difference? or factor? or inequalit$ or depriv$ or inequit$ or disparit$)).ti,ab.	74295
12	exp Educational Status/	117136
13	exp family size/	19709
14	((family or household) adj2 size).ti,ab.	6651
15	exp economic inequality/	781
16	((economic or financial or income or wealth) adj2 (disparit$ or inequit$ or inequalit$)).ti,ab.	6091
17	exp crime/	95136
18	(crime$ or criminal$ or convict$ or incarcerat$ or prison$ or jail$ or misdemeanor$ or felon$).ti,ab.	89327
19	exp occupation/ or exp named groups by occupation/	2611447
20	(occupation$ or job$ or career$ or work$).ti,ab.	2518599
21	exp health insurance/	301044
22	(competitive medical plan$ or employee health benefit plan or for-profit insurance plan$ or health benefit plan$ or healthcare insurance or health insurance exchange$ or health insurance or healthcare insurance or hospitalization insurance$ or independent practice association$ or medical insurance or managed care program$ or medicare or medigap insurance or medicaid or not-for-profit insurance or nursing insurance or nursing services insurance or pharmaceutical insurance or pharmaceutical services insurance or pharmacy insurance or physician services insurance$ or preferred provider$ or prepaid healthcare or prepaid health plans or psychiatric insurance or sickness benefit or sickness insurance or single-payer system or surgery insurance or surgical insurance or universal health coverage or obamacare or drug coverage or uninsured$ or underinsured$ or under-insured$ or un-insured$).ti,ab.	177136
23	exp socioeconomics/	1185244
24	(economic value of life or indigent healthcare$ or medical indigency or social economic aspect$ or social economics or social-economic factor$ or socio-economic aspect$ or socio-economic factor$ or socio-economics or socioeconomic aspect$ or socioeconomic factor$ or value of life or economic status or educational status or diploma$ or degree$ or drop-out$ or dropout$ or	2580969

	Search Terms	Results
	graduate$ or literat$ or numeracy or income group or pay equity or poverty or socioeconomic distribution).ti,ab.	
25	((discriminat$ or social exclu$ or social inclu$) adj3 (religion or culture or race or racial or aboriginal or indigenous or ethnic$)).ti,ab.	3162
26	((urban or rural or inner-city or slum) adj2 (difference$ or specific or analysis or inequit$ or disparit$ or inequalit$)).ti,ab.	6535
27	((treatment$ or vaccin$) adj3 (inequit$ or disparit$ or inequalit$ or access or utilisation or utilization)).ti,ab.	24380
28	(inequalit$ or inequit$ or disparit$ or (risk adj2 factor$) or driver$).mp.	1923360
29	((physical disability$ or mental health or mental illness or child* development) adj2 (disparit$ or inequalit$ or inequit$)).ti,ab.	1424
30	or/6-29	9206970
31	5 and 30	10492
32	31 not ((exp animal/ or nonhuman/) not exp human/)	10251
33	(case report or case series or woman or man or child or adolescent or female or male or boy or girl or infant).ti.	999263
34	case reports/ or case study/ or case report$.jx. or case report$.jw.	183345
35	(Ephemera or "Introductory Journal Article" or News or "Newspaper Article" or Editorial or Comment or Overall).pt. or in vitro Techniques/ or in vitro study/ or (commentary or editorial or comment or letter or mice or rat or mouse or animal or murine).ti.	3532781
36	review.pt. not (systematic or (meta and analy*) or ((indirect or mixed) and 'treatment comparison')).ti,ab.	2723782
37	or/33-36	7213498
38	32 not 37	7886
39	conference abstract.pt.	4494927
40	38 not 39	5262
41	(Andorra or Antigua or Barbuda or Aruba or Australia or Austria or Bahamas or Bahrain or Barbados or Belgium or Bermuda or British Virgin Islands or Brunei Darussalam or Canada or Cayman Islands or Channel Islands or Chile or Croatia or Curacao or Cyprus or Czech Republic or Denmark or Estonia or Faroe Islands or Finland or France or French Polynesia or Germany or Gibraltar or Greece or Greenland or Guam or Hong Kong or Hungary or Iceland or Ireland or Isle of Man or Israel or Italy or Japan or Korea or Kuwait or Latvia or Liechtenstein or Lithuania or Luxembourg or Macao or Malta or Monaco or Nauru or Netherlands or New Caledonia or New Zealand or Northern Mariana Islands or Norway or Oman or Palau or Poland or Portugal or Puerto Rico or Qatar or San Marino or Saudi Arabia or Seychelles or Singapore or Sint Maarten or Slovak Republic or Slovenia or Spain or "St. Kitts and Nevis" or "St. Martin" or Sweden or Switzerland or Taiwan or Trinidad or Tobago or "Turks and Caicos" or United Arab Emirates or United Kingdom or United States or Uruguay or Virgin Islands or Latin America$ or Belize or Costa Rica or El Salvador or Guatemala or Honduras or Mexico or Nicaragua or Panama or Argentina or Bolivia or Brazil or Colombia or Ecuador or French Guiana or Guyana or Paraguay or Peru or Suriname or Venezuela or Cuba or Dominican Republic or Haiti or Guadeloupe or Martinique or Saint-Barthelemy or Saint-Martin).af.	35324928
42	exp africa/ or (Afghanistan or Burkina Faso or Burundi or Central African Republic or Chad or Congo or Eritrea or Ethiopia or Gambia or Guinea or Guinea-Bissau or Korea or Liberia or Madagascar or Malawi or Mali or Mozambique or Niger or Rwanda or Sierra Leone or Somalia or Sudan or Syrian Arab Republic or Togo or Uganda or Yemen or Angola or Algeria or Bangladesh or Benin or Bhutan or Cabo Verde or Cambodia or Cameroon or Comoros or Congo or Cote d'Ivoire or Djibouti or Egypt or Eswatini or Ghana or India or	1506736

	Search Terms	Results
	Indonesia or Iran or Kenya or Kiribati or Kyrgyz Republic or Lesotho or Mauritania or Micronesia or Mongolia or Morocco or Myanmar or Nepal or Nigeria or Pakistan or Papua New Guinea or Philippines or Samoa or "Sao Tome and Principe" or Senegal or Solomon Islands or Sri Lanka or Tanzania or Tajikistan or Timor-Leste or Tunisia or Ukraine or Uzbekistan or Vanuatu or Vietnam or "West Bank and Gaza" or Zambia or Zimbabwe or Albania or American Samoa or Armenia or Azerbaijan or Belarus or "Bosnia and Herzegovina" or Botswana or Bulgaria or China or Dominica or Equatorial Guinea or Fiji or Gabon or Grenada or Guyana or Iraq or Jamaica or Jordan or Kazakhstan or Kosovo or Lebanon or Libya or Malaysia or Maldives or Marshall Islands or Mauritius or Moldova or Montenegro or Namibia or North Macedonia or Romania or Russia$ or Serbia or South Africa or "St. Lucia" or "St. Vincent and the Grenadines" or Thailand or Tonga or Turkey or Turkmenistan or Tuvalu).ti,ab.	
43	41 not 42	34120916
44	40 and 43	4196
45	limit 44 to yr="2012 -Current"	1751

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9 # Table S2. PECOS criteria

	Study Inclusion			**Study Exclusion**
	IMD Risk	**IMD Prevention (Engagement in Preventive Practices)**	**IMD Control (Disease Control)**	
Population	**IMD cases or carriers and controls (susceptible or not infected) of all ages** IMD cases/carriers/IMD patient population would include adults/adolescents/children/infants with one or more of the following descriptions: Patients with meningococcal disease/meningitis/ bacterial meningitis/meningococcaemia/septicaemia meningococcal sepsis/Waterhouse–Friderichsen syndrome Patients with bacterial infections caused by Neisseria meningitidis Patients with IMD caused by all serogroups	**IMD cases or carriers and controls (susceptible or not infected) of all ages** IMD cases/carriers/IMD patient population would include adults/adolescents/children/infants with one or more of the following descriptions: Patients with meningococcal disease/meningitis/ bacterial meningitis/meningococcaemia/septicaemia meningococcal sepsis/Waterhouse–Friderichsen syndrome Patients with bacterial infections caused by Neisseria meningitidis Patients with IMD caused by all serogroups	**IMD cases, long-term survivors of IMD, caregivers of IMD cases and long-term survivors of all ages** IMD cases/carriers/IMD patient population would include adults/adolescents/children/infants with one or more of the following descriptions: Patients with meningococcal disease/meningitis/ bacterial meningitis/meningococcaemia/septicaemia meningococcal sepsis/Waterhouse–Friderichsen syndrome Patients with bacterial infections caused by Neisseria meningitidis Patients with IMD caused by all serogroups	Populations not related to IMD or at-risk of IMD Patients with influenza/bacterial infections caused by Haemophilus influenzae Patients with pneumonia/bacterial infections caused by Streptococcus pneumoniae Patients with viral meningitis
Exposure* **	Exposures may have included, but were not limited to: social, economic, environmental, and other factors of health including the following: Person's individual characteristics and behaviors: Mental health Age Exposure to crime and violence Social and economic factors: Social deprivation Wealth Working life conditions Basic amenities Unemployment and job security Food security Early childhood development Structural conflict			Exposures that were not considered as factors that attribute to inequalities of health

	Ethnicity Sex/sexual orientation Religion Physical disability	Socioeconomic status Insurance status and type Education level Occupation	Access to affordable health services of decent quality Physical environment: Geographic location/region Housing and household size	
Comparator	Alternative levels within each exposure (e.g., rural/urban or differing levels of education). A "no comparator" was also to be used if applicable (e.g., employed vs. not employed)			NA
Outcomes	Studies reporting on the association between exposures and IMD risk for any of the following outcomes: IMD incidence IMD prevalence Carriage Mortality Sequelae HRQoL	Studies reporting on differences in exposures in relation to the following outcomes: Vaccine uptake Vaccine adherence/ Compliance Series completion	Studies reporting on differences in exposures in relation to the following outcomes s: HCRU due to complications during acute phase and due to long-term sequelae Hospitalisations ICU visits ER visits Outpatient care Specialist visits Differences in access to healthcare services for survivors and caregivers including, but not limited to, the following: Age-specific Sex-related Racial and ethnic Cost and affordability Geography/location related Insurance status and insurance type Economic costs due to sequelae treatment for survivors and caregivers All direct costs including: Treatment costs Medication costs Hospitalisation costs	Publications that report the following type of outcomes Clinical efficacy Safety Effectiveness of treatments/vaccines Clinical burden

			Other medical services costs All indirect costs including: Special education costs Productivity losses for survivors and caregivers (absenteeism, presenteeism, income loss)	
Study type	Observational studies (i.e., cohort, case control, cross-sectional, case series); Database studies; Modelling studies; Economic evaluations; SLRs or TLRs (for reference chasing only)			RCTs; Non-randomised and single-armed designs; In vitro/ ex vivo/ animal/ pharmacokinetic studies; Narrative reviews
Sub-analysis and subgroups of interest	Based on the following countries/Country specific subgroups in adults/adolescents/children: US* EU5 (France, Germany, Italy, Spain and the United Kingdom) Japan Other high-income countries Latin America^ COVID-19 Exposure as per Dahlgren model Outcomes (based on IMD risk, prevention and control) Age-based subgroups (e.g., infants vs. children vs. adolescents vs. adults vs. older adults, etc.) Different serogroups Study type-based subgroups			African region/Sub-Sahara Africa Middle and low-income countries**
Publication type	Full-text publications Conference abstracts and posters (2020–present)			Conference abstracts published prior to 2020; Editorials; Erratum; Trial protocols; Guidelines; Narrative reviews; Systematic reviews[µ]
Limits				
Time Period	2012–present			Studies published prior to 2012
Language	English, French, Spanish, Italian, Portuguese			Studies in other languages will be tagged but not extracted
Countries	High-income countries including US, EU5 (France, Germany, Italy, Spain and the United Kingdom), Latin America[^#]			African region/Sub-Sahara Africa

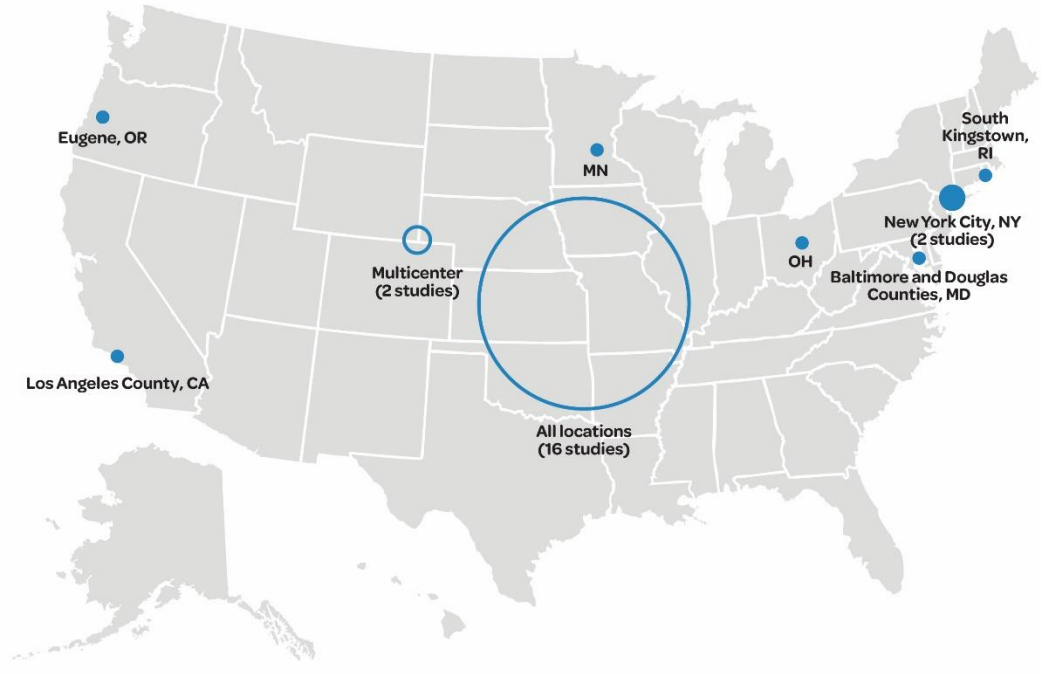
		Middle- and low-income countries*

Study characteristics summary (see Table S3)

Study populations included IMD patients,[19,20,28,30,32] MSM,[24,25,29] healthy volunteers,[23,55] students,[31,56] the general population (vaccinated or not),[34] insured populations,[21] parents/carers of IMD patients,[36] susceptible populations,[22] and healthcare providers (HCPs).[52]

Most studies (n=16) included nationwide data, while other studies were conducted in particular states e.g., California, Maryland, Minnesota, New York, Ohio, Oregon and Rhode Island (**Figure S2**).

Figure S2. US Geographical Locations Across the Included Studies



CA: California; MD: Maryland; MN: Minnesota; NY: New York; OH: Ohio; OR: Oregon; RI: Rhode Island

Most study designs were retrospective cohort[19,20,22,29,31,32,34] or cross-sectional studies, [21,24,28,36,56] while others included prospective cohorts[23,55] or case controls.[25,30] Sample sizes ranged from 34 IMD patients[19] to 32,9 million commercially-insured adults patients.[21] Data collection periods ranged from 13 years (i.e., from 2005 to 2018)[37,57] to <1 year.[27,34,36,39,52,56]

Study data sources included the National Notifiable Diseases Surveillance System (NNDSS),[19,29] Enhanced Meningococcal Disease Surveillance,[28,31] Active Bacterial Core surveillance and state health departments,[32] the National Immunization Survey-Teen (NIS-Teen) data,[10,26,38,39] and the NYC Department of Health and Mental Hygiene.[20,25] Medicaid and commercial claims databases were included.[21,22,30,33,37,56,57] Data were also collected from universities,[27,30,52,56] patient records,[34] surveys,[36] high schools,[23] and vaccination campaigns.[55]

33 # Table S3. Study characteristics

Study Name Author, Year	Country	Brief Patient Description	Study Design	Sample Size	Data Source	Data Collection Years	Outcomes Reported
Basta, 2019	US (Minnesota)	Parents of teens attending high school in 2017-2018	Cross-sectional study	445	University of Minnesota's Driven to Discover research facility	2017	IMD Prevention
Blain, 2021	US (all locations)	Meningococcal disease patients who were previously vaccinated with MenACWY vaccine	Retrospective cohort study	34	NNDSS	2014-2018	IMD Risk, IMD Control
Bloch, 2018	US (NYC)	Persons aged ≥15 years diagnosed with IMD	Retrospective cohort study	151	DOHMH	2008-2016	IMD Risk, IMD Control
Breakwell, 2018	US (South Kingstown, Rhode Island)	Undergraduate students tested for meningococcal carriage	Cross-sectional study	1,837	Survey at a Rhode Island university	2015	IMD Risk
Cheng, 2020	US (all locations)	Adolescents aged 17 years	Cross-sectional study	Unweighted: 22,928 Weighted: 3,948,025	NIS-Teen	2011-2016	IMD Prevention
Folaranmi, 2017	US (all locations)	MSM and non-MSM having meningococcal disease	Retrospective cohort study	527	NNDSS	2012-2015	IMD Risk
Ghaswalla, 2022	US (Multicentre, from a variety of geographic regions)	People with a new diagnosis of HIV who were eligible for MenACWY vaccine	Retrospective cohort study	1,208	Optum Research Database	2016-2018	IMD Prevention
Ghaswalla, 2021	US (all locations)	Patients with newly diagnosed asplenia and eligible for MenACWY or MenB vaccination	Retrospective cohort study	MenACWY: 2,273 MenB: 741	Optum Research Database	2005-2018	IMD Prevention

Hansen, 2021	US (all locations)	Adolescents aged 17 years	Cross-sectional study	7,288	NIS-Teen	2017-2018	IMD Prevention
Harrison, 2015	US (Baltimore County, Maryland and Douglas County)	High school students vaccinated with MCV4	Prospective cohort study	3,311	High school vaccination record	2006-2007	IMD Risk
Holloway, 2018	US (Los Angeles County)	MSM who might or might not have received the MenACWY vaccine	Cross-sectional study	368	NR	2016-2017	IMD Prevention
Huang, 2020	US (Multicentre, Lightspeed/All Global panel of >55,600 US HCPs)	Patients who received or did not receive MenB vaccine within the previous 6 months	Retrospective cohort study	1,521	Patient chart review conducted by HCPs	2017	IMD Prevention
Kempe, 2018	US (all locations)	Paediatricians and family physicians	Cross-sectional study	660	University of Colorado Denver	2016	IMD Prevention
Krishnarajah, 2014	US (all locations)	Adult Medicaid and commercially insured populations	Cross-sectional study	Medicaid: 1,658,054 Commercial: 2,800,0862	Truven MarketScan® Medicaid and commercial databases	2006-2010	IMD Risk
Kurosky, 2019	US (all locations)	Younger adolescents aged 10.5 through 13 years and older adolescents aged 15.5 years through 18 years	Retrospective cohort study	Commercial Claims and Encounters Younger adolescents: 376,825 Older adolescents: 419,814 Medicaid Younger adolescents: 310,383 Older adolescents: 206,301	Commercial Claims and Encounters and Medicaid MarketScan Databases	2011-2016	IMD Prevention
La, 2021	US (all locations)	Adolescents aged 17 years	Cross-sectional study	7,288	NIS-Teen	2017-2018	IMD prevention

Mandal, 2013	US (Ohio)	Confirmed meningococcal disease (cases) and matched controls	Case control study	42	University	2008-2010	IMD Risk
Marshall, 2022	US (all locations)	Patients with complement component deficiencies and eligible for MenACWY or MenB vaccination	Retrospective cohort study	MenACWY: 1,470 MenB: 396	Optum Research Database	2005-2018	IMD Prevention
Mbaeyi, 2019	US (all locations)	All confirmed and probable meningococcal cases in students aged 18 to 24 years	Retrospective cohort study	163	NNDSS and EMDS	2014-2016	IMD Risk
Mbaeyi, 2019	US (all locations)	Cases of meningococcal disease (sporadic and outbreak-associated)	Retrospective cohort study	3,686	NNDSS, Active Bacterial Core surveillance and state health departments	2009-2013	IMD Risk
McNamara, 2017	US (Eugene, Oregon)	Healthy participants (to assess carriage rate)	Prospective cohort study	4,225	Vaccination campaign in response to a university serogroup B meningococcal disease outbreak	2015-2016	IMD Risk
Packnett, 2022	US (all locations)	Adolescents and young adults with private (Commercial) and Medicaid insurance who initiated MenB vaccination	Retrospective cohort study	Commercial: 156,080 Medicaid: 57,082	IBM MarketScan Commercial Claims and Encounters databases; IBM MarketScan Multi-State Medicaid Database	2014-2020	IMD Prevention
Pingali, 2021	US (all locations)	Adolescents aged 13-17 years	Cross-sectional study	NR	NIS-Teen	2020	IMD Prevention
Ridpath, 2015	US (NYC)	MSM with outbreak-related serogroup C meningococcal disease	Case control study	68	NYC DOHMH	2012-2013	IMD Risk
Rudmann, 2022	US (all locations)	PEH and non-PEH with IMD	Cross-sectional study	1,409	NNDSS and EMDS	2016-2019	IMD Risk

Srivastava, 2020	US (all locations)	Adult parents or guardians (aged within the range of 35 to ≥65 years) of ≥1 dependent aged 16 to 19 years	Cross-sectional study	619	Survey (participants were identified through the Ipsos Knowledge Panel®)	2016	IMD Prevention

DOHMH: Department of Health and Mental Hygiene; **EMDS:** Enhanced Meningococcal Disease Surveillance; **HCP:** healthcare provider; **IMD:** invasive meningococcal disease; **MCV4:** quadrivalent meningococcal conjugate vaccine; **MenACWY:** quadrivalent meningococcal conjugate vaccine (serogroups A, C, W, Y); **MenB:** meningococcal serogroup B; **MSM:** men who have sex with men; **NIS-Teen:** National Immunization Survey-Teen; **NNDSS:** National Notifiable Diseases Surveillance System; **NR:** not reported; **NYC:** New York City; **PEH:** people experiencing homelessness; **US:** United States

Table S4. Quality Assessment Scores Using Newcastle Ottawa Scales

Author, Year	Total Score
NOS - Case Control (n=2)	
Mandal, 2013	5
Ridpath, 2015	6
NOS - Cohort (n=13)	
Blain, 2021	7
Bloch, 2018	7
Folaranmi, 2017	6
Ghaswalla, 2021	9
Ghaswalla, 2022	8
Harrison, 2015	7
Huang, 2020	5
Kurosky, 2019	6
Marshall, 2022	7
Mbaeyi, 2019 (refID 861)	7
Mbaeyi, 2019 (refID 957)	7
McNamara, 2017	5
Packnett, 2022	9
NOS - Cross-sectional (n=11)	
Basta, 2019	6
Breakwell, 2018	6
Cheng, 2020	8
Hansen, 2021	8
Holloway, 2018	9
Kempe, 2018	5
Krishnarajah, 2014	9
La, 2021	8
Pingali, 2021	7
Rudmann, 2022	7
Srivastava, 2020	7

Abbreviations: NOS = Newcastle Ottawa Scale

File S1. Complementary results

Results showing no association between characteristics and IMD risk and prevention, or an association but not likely to have a high impact on equity.

IMD risk and prevention and individual characteristics/behaviors

IMD prevention by race/ethnicity:

In an MSM population with HIV (12.8%), no association between ethnicity/race and MenACWY vaccine uptake was reported (aOR: non-Hispanic White [reference]; non-Hispanic Black/African American: 1.3 [95% CI 0.51–3.36]; Hispanic: 1.53 [95% CI 0.69–3.38]; Others: 0.51 [95% CI 0.18–1.45]).[24]

MenB vaccination coverage in adolescents aged 17 years tended to be higher (non-significant) in Hispanic versus non-Hispanic White adolescents (OR 1.31 [0.92-1.86]) and lower (non-significant) in Black versus non-Hispanic White adolescents (OR 0.74 [0.48-1.14]) (NIS-Teen 2017–2018 data), but multivariate models showed no associated with race/ethnicity.[10,38]

Age

Inequalities in IMD risk by age:

Incidence

Incidence of IMD is highest in infants and young children,[58] however, no studies assessed inequalities in these age groups. Among adults, the incidence of IMD increased with age across both Medicaid and commercially-insured populations, with the lowest incidence (per

100,000 persons) in 19-34-year-olds (male 11.1 and female 7.8 with Medicaid; male 1.2 and female 1.5 with Commercial) and the highest in 55-64-year-olds (male 39.4 and female 42.6 with Medicaid; male 3.9 and female 4 with Commercial).[21]

There was a positive correlation between IMD incidence and age, up to the age of 64 years, for both sporadic and outbreak MenB cases, after which incidence decreased in individuals ≥65 years. Serogroup B was responsible for most organization-based outbreak cases aged 11-24 years, and serogroup C for most community outbreak cases aged median 1-42 years.[32]

Among adult MSM in New York City (NYC), Los Angeles, and Chicago, as well as sporadic cases across the US, the proportion with IMD peaked in 26-35-year-olds (43.2%) and decreased thereafter in 36-55-year-old age groups (16.2-18.9%), with the lowest proportion in 56-64-year-olds (1.4%). Most cases in MSM were due to serogroup C and occurred in age groups not currently recommended to receive MenACWY. Among non-MSM, the highest proportion with IMD was in 18-25-year-olds (31.4%) decreasing thereafter, with significant differences ($p<0.001$) in proportions with IMD by age groups between MSM and non-MSM.[29]

Mortality

No difference in IMD mortality by age was found in a study in NYC (from 2008-2016): compared to the age group 25-44 years (reference group), the adjusted relative risk (aRR) of IMD mortality was aRR 0.55 (95% CI 0.24–1.22) for ages ≥65 years; aRR 0.79 (95% CI 0.40–1.56) for ages 45–64 years; aRR 0.61 (95% CI 0.27–1.34) for ages 15–24 years.[20]

Carriage

Older high school students were at higher risk of meningococcal carriage than younger age groups (odds ratio OR 1.3, 95% CI 1.2–1.5) across eight high schools in Maryland and

Georgia.[23] IMD carriage in university students in Oregon (2015-2016) was significantly higher in 20-year-olds versus other age groups (prevalence ratio 1.6, 95% confidence interval [95% CI] 1.1–2.3).[55] However, in university students in Rhode Island (2015), no significant association between IMD carriage and age group was reported (prevalence ratio 1.00, 95% CI 0.98–1.03].[56]

Inequalities in IMD prevention by age:

MenACWY

Older adolescents (aged 15.5-18 years) were less likely to receive MenACWY compared with younger adolescents (aged 10.5-13 years), based on data from the Commercial Claims and Encounters (CCAE) and Medicaid MarketScan Databases (adjusted odds ratio aOR 0.68 [0.67-0.69]).[33] By contrast, the 2017-2018 NIS-Teen data reported MenACWY vaccination coverage was higher in adolescents aged 15 and 17 years versus 13, 14 or 16 years.[39]

MenB

MenB (MenB-4C and MenB-FHbp) series completion rates in 16-23-year-olds were significantly higher with MenB-4C versus MenB-FHbp (61.1% vs 49.8% and 47.8% vs 33.9% in commercial and Medicaid populations, respectively), and both MenB-4C and younger age were independently associated with a higher likelihood of series completion in commercial and Medicaid populations (e.g., aRR 0.57 [0.52–0.62] and aRR 0.43 [0.32–0.57] for 23 versus 16-year-olds in commercially-insured and Medicaid populations, respectively).[35]

Assessment of MenB vaccination practices in primary care showed a higher likelihood of pediatricians and family physicians strongly recommending MenB vaccination for healthy

16-18-year-olds and adolescents/young adults entering college than for healthy 11-12-year-olds.[52]

MenACWY/MenB in chronic conditions

MenACWY coverage (≥1 dose) in newly diagnosed asplenia patients was significantly lower in patients aged ≥19 years versus those aged 2-10 years (HR 0.21 [95% CI 0.14–0.31]).[37] Similarly, MenB coverage (≥1 dose) in newly diagnosed asplenia patients aged ≥19 years was significantly lower than in 10-18-year-olds (HR 0.34 [0.15–0.79]).[37] In patients with complement component deficiencies, MenACWY vaccination was much more likely in children and adolescents than adults (11.3% for 2–10 years of age; 29.7% for 11–18 years; 1.6% for 19–55 years; and 1.2% for ≥56 years); and no adults had received MenB vaccination versus 13.0% of those aged 10–18 years.[57] In patients with a new diagnosis of HIV eligible for MenACWY, patients aged ≥56 years were significantly less likely to receive MenACWY than patients aged 2-55 years (HR 0.42 [95% CI 0.18–0.97]).[22] Among MSM in Los Angeles County, those aged ≥30 years had a significantly higher MenACWY vaccine uptake compared with those aged 18-29 years (aOR 2.57 [95% CI 1.31–5.03])

IMD risk by sex/ sexual orientation:

No difference in mortality was found for MSM versus non-MSM (32.4% vs. 23.5%) in NYC (2012-2015).[29]

Sex/ Sexual Orientation

Inequalities in IMD risk by sex/ sexual orientation:

Incidence

IMD outbreak cases across 16 US states between 2009 and 2013, reported 65% of cases were in men.[32] In NYC, mean annual IMD incidence (per 100,000) between 2008 and 2016 was higher in men (0.3) than in women (0.2).[20]

The mean annual US IMD incidence (per 100,000 persons from 2012-2015) was higher in 18-64-year-old MSM compared with non-MSM (annualized incidence rate 0.56 vs. 0.14, relative risk [RR] 4.0 [95% CI 3.1–5.1]).[29] Incidence among sporadic cases were higher in MSM versus non-MSM (annualized incidence rate 0.26 vs. 0.14, RR 1.9 [95% CI 1.3–2.8]).[29] Similarly, the median number of community outbreak cases among MSM (13) was higher than in non-MSM (3) over the period 2009-2013.[32]

Mortality

In a population aged ≥15 years in NYC (2008-2016), IMD case-fatality rate (CFR) was higher in women than men (37% vs. 19%, risk of death 2.1 [95% CI 1.2–3.8]).[20] There was an association between sex and IMD after controlling for age, race/ethnicity, neighborhood-level poverty, serogroup, altered mental status, petechiae, Hepatitis C and shock.[20] Women with IMD were 13.7 times as likely to die as men (95% CI 3.2–58.1), compared with women without IMD, who were 1.9 times as likely to die as men (95% CI 1.1–3.5).[20]

Carriage

In university students in Rhode Island (2015), male students were at a higher risk of meningococcal carriage than female students (OR 1.66 [95% CI 1.29–2.14]).[29] Similarly,

among outbreak cases in university students in Oregon (2015-2016), males were associated with increased carriage compared with females (prevalence ratio 1.2 [95% CI 1.0–1.5]).[55]

Inequalities in IMD prevention by sex/sexual orientation:

MenACWY

Females aged 17 years were less likely to complete the primary and booster dose of the MenACWY vaccine (OR 0.63 [95% CI 0.56–0.71]) and comply with ACIP meningococcal vaccination recommendations (0.67 [0.60–0.76]) than males, based on NIS-Teen 2011-2016 data.[26] Female adolescents also had a higher likelihood of ≥1 missed opportunities for receipt of ≥1 MenACWY vaccine versus males (aOR 1.08 [95%CI 1.07–1.09]).[33]

In newly diagnosed HIV patients (2016 to 2018), males were associated with increased uptake of the MenACWY vaccine compared with females (HR 2.72 [95% CI 1.18–6.26]).[22] In newly diagnosed asplenia patients, males also had a higher likelihood of receiving ≥1 dose of MenACWY vaccine than females (HR 1.24 [1.05–1.46]).[37]

There was no association between MenACWY vaccination coverage and the number of sexual partners in the previous six months, for adult MSM.[24]

MenB

In 16-23-year-olds, MenB series completion was significantly higher for females versus males in MenB-4C vs. MenB-FHbp, for both commercial and Medicaid populations (aRR 1.02 [1.02–1.03] for commercial and aRR 1.05 [1.03–1.06] for Medicaid).[35]

Among adult parents or guardians of ≥1 dependent aged 16 to 19 years, male parents/ guardians were mostly not aware of MenB vaccines, compared with female parents/ guardians (OR 0.43, 95% CI 0.26–0.7).[36]

While HCPs were more likely to prescribe MenB vaccines to males, males and females were equally likely to receive MenB vaccination (OR 0.84).[34] Results from NIS-Teen and a parental survey also showed no association between receipt (OR 1.00 [0.76–1.32])[10,38] or coverage (OR 0.89 [0.68–1.15])[38] of ≥1 dose of MenB vaccine for female versus male adolescents.

MenB vaccination coverage in newly diagnosed asplenia patients (Optum Research Database 2016–2018) observed no association between sex and MenB uptake.[37]

Students

Inequalities in IMD risk in students:

Incidence

IMD outbreak cases in a university in Ohio were associated with attending bars (85.7% cases vs. 37.1% controls, matched OR 8.06 [95% CI 1.12–∞]).[30]

In university students, IMD outbreak cases (2008-2010) were associated with having more than one kissing partner, in univariate analysis (66.7% cases vs. 22.9% controls, matched OR 13.66 [95% CI 1.23–708.7]).[30]

In university students who were freshman (78%) living in residential halls, or non-students who socialized or interacted with university students, Greek society/fraternity/sorority membership was associated with IMD incidence (42.9% cases vs. 2.9% controls, matched OR 15.0 [95% CI 1.2–787.5]).[30]

No association was found among MSM outbreak cases in NYC between 2012 and 2013 (70% cases vs. 52.5% controls, matched OR adjusted for HIV infection 1.8 [95% CI 0.4–10.6]).[25]

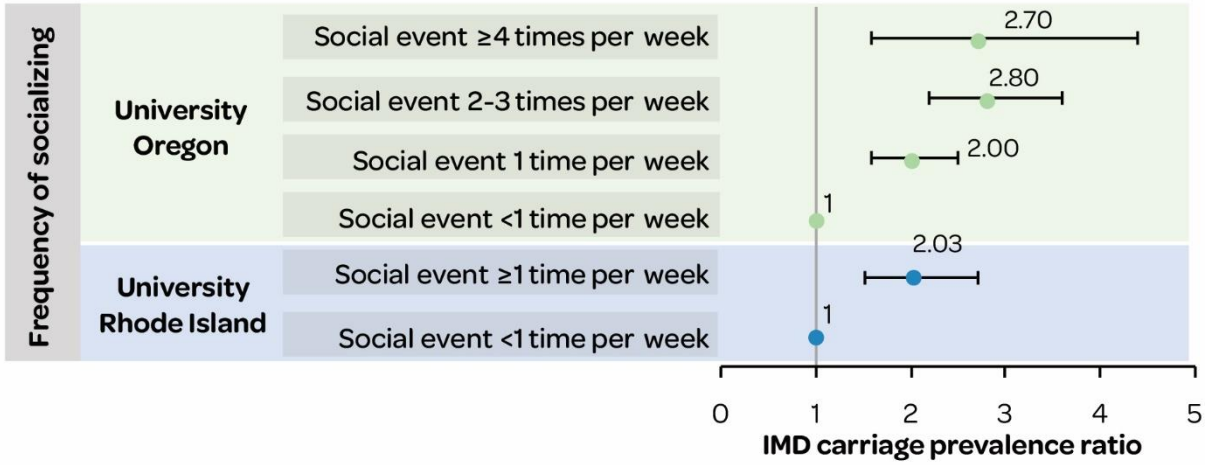
A non-significant association between IMD outbreak and "sex with >1 man during month before illness" was reported in MSM in NYC (2012-2013) (61.5% cases vs. 35.3% controls, matched OR adjusted for HIV infection, 2.8 [95% CI 0.7–13.7].[25]

In university students who were freshman (78%) living in residential halls, or non-students who socialized or interacted with university students, no associations were found for sports team members 42.9% cases vs. 22.9% controls, matched OR 15.0 [95% CI 0.31–13.54]) or other club members (14.3% vs. 37.1%, matched OR 0.3 [95% CI 0.006–2.8]).[30] No association was found with having more than one sexual partner, in univariate analysis (42.9% cases vs. 25.7% controls, matched OR 1.97 [95% CI 0.27–12.56]).[30]

Carriage

University students in Rhode Island (2015)[56] and Oregon (2015-2016)[55] with more frequent social events (e.g., bars/parties) were at higher risk of IMD carriage (**Figure S3**).

Figure S3. IMD carriage (prevalence ratio) by frequency of socializing



Illegal Drug Use

Inequalities in IMD risk by drug use:

Incidence

Use of methamphetamine or cocaine during the month before IMD onset was associated with IMD outbreak cases in MSM, after controlling for HIV (methamphetamine cases vs. controls: 41.2% vs. 0%, matched OR 16.6 [95% CI 3.1–∞]; cocaine cases vs. controls: 28.6% vs. 0%, matched OR 11.2 [95% CI 1.8–∞]).[30]

IMD outbreak cases were not associated with marijuana use in university students (2008-2010) (42.9% cases vs. 28.6% controls, matched OR 1.85 [95% CI 0.23–12.81]); or in MSM in NYC (2012-2013) (20% cases vs. 25.5% controls, matched OR 0.5 [95% CI 0.1–2.4]).[30]

IMD prevention by drug use:

No association was observed between illicit drug use and vaccine uptake among MSM during an IMD outbreak (aOR 1.21 [95% CI 0.65–2.24]).[24]

Chronic conditions

Inequalities in IMD risk for chronic conditions:

Incidence

HIV infection was associated with increased IMD incidence in MSM in NYC (2012-2013) (58.8% cases vs. 25.5% controls, matched OR 6.4 [95% CI 1.5–45.1]);[25] and in MSM aged 18 to 64 years across the US (2012-2015) i.e., annualized incidence rate per 100,000 in non-HIV infected MSM (0.23) vs. HIV-infected (2.28) (RR 10.1 [95% CI 6.1–16.6]).[29]

No difference was observed in IMD mortality in immunosuppressed (13%) versus non-immunosuppressed (15%) populations, among individuals who received one or more doses of MenACWY vaccine in the US between 2014 and 2018.[19]

Inequalities in IMD prevention for chronic conditions:

MenACWY

A history of asthma was associated with a higher odds of MenACWY primary and booster dose compliance in adolescents aged 17 years (NIS-Teen data) (OR 1.17 [1.00–1.37]).[26]

MenB

In primary care, MenB vaccination was strongly recommended by more HCPs for ≥10-year-olds with an increased risk for meningococcal disease (81% of pediatricians and 56% of family physicians) versus for healthy 11- to 12-year-olds (11% of pediatricians and 33% of family physicians), healthy 16- to 18-year-olds (58% of pediatricians and 50% of family physicians, non-significant) or healthy adolescents/young adults entering college (66% of pediatricians and 56% of family physicians, non-significant).[52]

Having other high-risk health conditions was not associated with MenACWY primary and booster dose completion or compliance (MenACWY compliance OR 1.23 [0.98–1.54]).[26]

A history of asthma had no association with MenACWY booster vaccination.[26]

No association was found between HIV status and MenACWY vaccine uptake in an adult MSM population (aOR 1.12, 95% CI 0.43–2.91).[24]

Pre-index HIV versus no HIV was not significantly associated with MenB vaccination series completion rates in 16-23-year-olds, from commercial insurance and Medicaid populations (OR 1.16 [0.78–0.1.73]).[35]

Smoking

Inequalities in IMD risk by smoking:

Carriage

IMD carriage was associated with current smokers versus non-smokers (12% vs. 5.0%, OR 1.6 [95% CI 1.1–2.4]) in high school students in Georgia and Maryland.[23] Similarly in university students in Oregon in 2015, an association was found between smoking status and IMD carriage (any serogroup; MenB): (prevalence ratio 1.4 [95% CI 1.2–1.7]; 2.0, [95% CI 1.1–3.6]);[55] and in undergraduate students in a Rhode Island university in 2015 (adjusted prevalence ratio 1.53, 95% CI 1.21–1.94).[56]

A difference in IMD carriage was reported in high school students who lived in households with other smokers compared with those who did not (7.4% vs. 4.6%).[23]

No association with IMD carriage was found in university students with versus without second-hand smoke exposure in the past 30 days (adjusted prevalence ratio 1.17 [95% CI 0.91–1.51]).[56]

Access to care

IMD prevention by access to care:

A non-significant trend of lower MenB vaccination rates (≥1 dose) was observed in individuals who had not received their last check-up at age 16 or 17 years (not aged 16/17 at last-checkup 6.9% [4.0–11.6] vs. 16.8% [15.0–18.7]), OR yes vs. no 1.78 [0.97–3.04], p=0.0645) (NIS-Teen data 2017–2018).[10,38]

IMD risk and prevention and socioeconomic factors

IMD prevention by insurance type/status

No association was found between MenACWY primary and booster dose completion and health insurance.[26]

IMD prevention by social deprivation

No association was found for MenACWY primary and booster dose compliance and income.[26]

Among MSM, during an IMD outbreak in Southern California, there was no association between household income and MenACWY vaccine uptake (aOR 0.77 [95% CI 0.33–1.8]); either by residing region (aOR 1.29, 95% CI 0.67–2.49) nor residing in a ZIP code where ≥20% of all families were living below the federal poverty level (aOR 0.97, 95% CI 0.48–1.93).[24]

IMD risk by education level

No difference in IMD mortality was found (12.4% vs. 13%, p=0.83). Incidence of serogroups C, W and Y were low, but more prominent in those with serogroup B (0.17 vs. 0.05, RR 3.54 [2.21-5.41]).[31] No association was found between incidence of outbreak-related IMD cases and grade point average in university students.[30]

No association for IMD carriage and class years (freshman, sophomore, junior and senior) was found in universities in Rhode Island and Oregon (2015-2016).[55,56]

In an MSM population, education status was not associated with MenACWY vaccine uptake (aOR 0.91 [0.48–1.74]).[24]

IMD risk by homelessness

There was no difference in the number of deaths across the PEH (4.4%) and non-PEH (12.5%) groups.[28]

IMD risk and prevention and environmental factors

IMD risk by housing/household size

Among US freshmen university students (78%) and lived in residential halls, or non-students who socialized or interacted with university students: no difference was found in IMD incidence by living in residence halls (100% cases vs. 97.1% controls, OR 0.20 [95% CI 0.005–∞].[30]

There was no difference in IMD carriage among university students in Rhode Island (2015) who lived in residence halls versus those who did not live in residence halls (prevalence ratio 0.85 [95% CI 0.66–1.10]);[56] or among university students in Oregon (2015-2016) who lived on-campus versus off-campus (prevalence ratio 1.3 [95% CI 0.7–2.2]);[55] or due to number of roommates (roommates 0-3+, 1.0 [0.7–1.4]; 2 roommates, 1.0 [0.7–1.5]; 3+ roommates, 1.2 [0.8–1.7]).[55]

Table S5. Inequalities in IMD incidence by individual characteristics/behaviors

Author Year	Patients	Exposure	IMD incidence	Interpretation of impact on inequality
Krishnarajah 2014 [21]	Medicaid: 1,658,054 adults Commercial: 2,800,0862 adults Years 2006-2010 Ages 19-64y	Age (stratified by sex)	Mean incidence proportions (per 100,000) Medicaid 19-34y male: 11.1 vs. female: 7.8 35-44y male: 18.7 vs. female: 13.4 45-54y male: 27.2 vs. female: 28.7 55-64y, male: 39.4 vs. female: 42.6 Commercial 19-34y male: 1.2 vs. female: 1.5 35-44y male: 1.4 vs. female: 1.8 45-54y male: 2 vs. female: 2.7 55-64y male: 3.9 vs. female: 4	The incidence of IMD increased with age in both male and female, and in Medicaid and Commercially insured populations. There is inequality due to age and insurance type on the incidence proportion of IMD.
Mbaeyi 2019 [32]	N=3,686 IMD cases (sporadic and outbreaks) aged <1y-≥65y	Age	Incidence proportion n (%) Sporadic <1 year: 415 (11.8) 1-10 years: 447 (12.8) 11-24 years: 706 (20.1) 25-64 years: 1,250 (35.7) ≥65 years: 688 (19.6) Outbreak-associated <1 year: 8 (4.4) 1-10 years: 36 (20.0) 11-24 years: 63 (35.0) 25-64 years: 63 (35.0) ≥65 years: 10 (5.6)	Age was positively correlated with incidence till the age group of ≥65 years, for both, sporadic and outbreak-associated cases. Outbreak-associated cases reported to have more cases from the age groups of 11-24 and 25-64, while sporadic cases observed to have more of 25-64 age group individuals. Numerically, there was inequality in IMD incidence as per age categories.
Folaranmi 2017 [29]	N=527 MSM and non-MSM with IMD	Age	Proportion of individuals n (%): MSM 18-25y: 15 (20.3) 26-35y: 32 (43.2) 36-45y: 14 (18.9) 46-55y: 12 (16.2) 56-64y: 1 (1.4) Non-MSM 18-25y: 142 (31.4) 26-35y: 99 (21.8)	The largest proportion of IMD cases reported as MSM occurred among men aged 26–35 years (43.2%) and for non-MSM cases among men aged 18–25 years (31.4%). There is inequality in IMD incidence across age groups in MSM and non-MSM groups.

			36-45y: 61 (13.5) 46-55y: 87 (19.2) 56-64y: 64 (14.1) p<0.001	
Folaranmi 2017 [29]	N=527 MSM and non-MSM with IMD	Sex /sexual orientation	Proportion of individuals n (%) MSM (as per serogroup) B: 5 (6.8) C: 62 (83.8) W: 2 (2.7) Y: 3 (4.1) Other: 1 (1.4) Unknown: 1 (1.4) Non-MSM (as per serogroup) B: 125 (27.6) C: 98 (21.6) W: 51 (11.3) Y: 75 (16.6) Other: 32 (7.1) Unknown: 72 (15.9) p<0.001	The largest proportion of IMD cases reported in MSM had serogroup C and serogroup B for non-MSM. There were inequalities in incidence of different IMD serogroups for MSM and non-MSM groups.
Folaranmi 2017 [29]	N=527 MSM and non-MSM with IMD	Sex /sexual orientation	RR (95% CI) (MSM vs. Non-MSM): 4.0 (3.1-5.1); p<0.001	IMD incidence was significantly higher in MSM compared to non-MSM. Hence, there is an inequality in IMD risk between these two groups.
Bloch 2018 [20]	N=151 aged ≥15y with IMD	Sex /sexual orientation	Annual incidence rate per 100,000 persons: Males: 0.3 per 100,000 persons Females: 0.2 per 100,000 persons	Incidence rate was similar between sexes.
Mbaeyi 2019 [32]	N=3,686 IMD cases (sporadic and outbreaks) aged <1y-≥65y	Sex /sexual orientation	Incidence proportion n (%): For sporadic cases; 1,719 (49.4) in male; 1,758 (50.6) in females For outbreak-associated cases; 117 (65.4) in male; 62 (34.6) in females	Outbreak-associated cases reported to have more males (numerically), while sporadic cases observed to have similar proportion of either sex. There is an inequality in IMD sporadic cases as per sex.
Mbaeyi 2019 [32]	N=112 IMD cases (sporadic and outbreaks) aged <1y-≥65y	Sex /sexual orientation	Median number (range) of cases in outbreaks: 13 (4-22) for MSM cohort; 3 (2-14) for non-MSM cohort	MSM reported to have higher number of meningococcal disease cases as compared to non-MSM population. Numerically, there is an inequality in incidence of IMD cases as per sexual orientation.
Mandal 2013 [30]	N=42 confirmed IMD (n=7) and matched controls (n=35)	Sex /sexual orientation	Proportion n (%): 5 (71.4) and 18 (51.4) males in cases and controls, respectively; OR (95% CI) (cases vs. controls): 2.36 (0.32–29.6)	Proportion of males did not differ significantly between cases and controls

Mandal 2013 [30]	N=42 confirmed IMD (n=7) and matched controls (n=35)	Sex /sexual orientation	Proportion n (%):3 (42.9) and 9 (25.7) >1 sexual partner in cases and controls, respectively; OR (95% CI) (cases vs. controls): 1.97 (0.27-12.56)	Having >1 sexual partner was not significantly different between cases and controls.
Ridpath 2015 [25]	N=68 MSM with outbreak MenC (n=17) vs MSM with no IMD (n=51)	Sex /sexual orientation	Matched OR (95% CI): 2.8 (0.7–13.7) for cohort of sex with >1 man during month before illness onset; 1.8 (0.4–10.6) for cohort of met a male sex partner during month before illness onset online or at bar or party versus other ways	Having sex with >1 man during month before illness onset or meeting a male sex partner during month before illness onset online or at bar or party versus other ways was not associated with the risk of IMD in this cohort of MSM individuals.
Ridpath 2015 [25]	N=68 MSM with outbreak MenC (n=17) vs MSM with no IMD (n=51)	Sex /sexual orientation	Proportion of individuals n (%) Gay: 15/17 (88.2) in cases; 45/50 (90.0) in controls Bisexual: 2/17 (11.8) in cases; 5/50 (10.0) in controls	There was no difference in case proportion in gay and bisexual.
Folaranmi 2017 [29]	N=527 MSM and non-MSM with IMD	Ethnicity/ Race	Proportion of individuals n (%) MSM Hispanic: 20 (27) Non-Hispanic: 50 (67.6) Unknown: 4 (5.4) Non-MSM Hispanic: 82 (18.1) Non-Hispanic: 276 (60.9) Unknown: 95 (21) MSM vs non-MSM p=0.003	The largest proportion of IMD cases reported in MSM and non-MSM occurred among the non-Hispanic group when compared to the Hispanic and unknown groups. There is inequality in IMD incidence across ethnicities for both MSM and non-MSM.
Folaranmi 2017 [29]	N=527 MSM and non-MSM with IMD	Ethnicity/ Race	Proportion of individuals n (%) MSM White: 37 (50) Black: 29 (39.2) Asian: 2 (2.7) Other: 3 (4.1) Unknown: 3 (4.1) Non-MSM White: 268 (59.2) Black: 92 (20.3) Asian: 5 (1.1) Other: 19 (4.2) Unknown: 69 (15.2) MSM vs non-MSM p<0.001	The largest proportion of IMD cases reported in MSM and non-MSM occurred among the White group as compared to Black, Asian, Other or Unknown groups. There are inequalities in IMD incidence across racial and ethnic groups.
Ridpath 2015 [25]	N=68 MSM with outbreak MenC (n=17)	Ethnicity/ Race	Matched OR (95% CI): 8.0 (1.6–63.7) for Black race; p<0.05	Black race was significantly associated with IMD infection. Hence, there is an inequality in IMD incidence by race.

	vs MSM with no IMD (n=51)			
Mbaeyi 2019 [32]	N=3,686 IMD cases (sporadic and outbreaks) aged <1y-≥65y	Ethnicity/ Race	Incidence proportion n (%) Sporadic White: 2,251 (76.7) Black: 492 (16.8) Other: 191 (6.5) Hispanic: 492 (18.7) Not Hispanic: 2,141 (81.3) Outbreak-associated White: 104 (70.3) Black: 30 (20.3) Other: 14 (9.4) Hispanic: 35 (24.3) Not Hispanic: 109 (9.4)	Similar trend of having more cases of White and not Hispanics was observed across both outbreak-associated and sporadic population. An inequality was reported as per ethnicity/race.
Mandal 2013 [30]	N=42 confirmed IMD (n=7) and matched controls (n=35)	Ethnicity/ Race	Proportion n (%): 7 (100) and 31 (88.6) White non-Hispanic in cases and controls, respectively; OR (95% CI) (cases vs. controls): 1.06 (0.13-∞)	Proportion of White non-Hispanic did not differ significantly between cases and controls.
Mandal 2013 [30]	N=42 confirmed IMD (n=7) and matched controls (n=35)	Smoking	Proportion n (%): 2 (28.6) and 4 (11.4) Regular smoker (on average ≥1 cigarette/d) in cases and controls, respectively; OR (95% CI) (cases vs. controls): 3.45 (0.22-53.02)	Proportion of regular smokers did not differ significantly between cases and controls
Mandal 2013 [30]	N=42 confirmed IMD (n=7) and matched controls (n=35)	Smoking	Proportion n (%): 5 (71.4) and 15 (42.9) second-hand smoke exposure in cases and controls, respectively; OR (95% CI) (cases vs. controls): 4.73 (0.46-244.1)	Proportion of second-hand smokers did not differ significantly between cases and controls.
Ridpath 2015 [25]	N=68 MSM with outbreak MenC (n=17) vs MSM with no IMD (n=51)	Smoking	Matched OR (95% CI): 0.9 (0.2–3.3) for tobacco smoking	Smoking was not associated with an increased risk of infection.
Ridpath 2015 [25]	N=68 MSM with outbreak MenC (n=17) vs MSM with no IMD (n=51)meningococcal disease (controls)	Alcohol	Matched OR (95% CI): 1.2 (0.3–5.5) for shared a drink	Sharing a drink was not associated with increased risk of infection.
Mandal 2013 [30]	N=42 confirmed IMD (n=7) and matched controls (n=35)	Alcohol	Proportion n (%): 7 (100) and 31 (88.6) Drinks alcohol in cases and controls, respectively; OR (95% CI) (cases vs. controls): 1.13 (0.11-∞)	Proportion of students who drink alcohol did not differ significantly between cases and controls

Mandal 2013 [30]	N=42 confirmed IMD (n=7) and matched controls (n=35)	Alcohol	Proportion n (%): 7 (100) and 26 (74.3) Binge drinks in cases and controls, respectively; OR (95% CI) (cases vs. controls): 2.83 (0.39-∞)	Proportion of binge drinkers did not differ significantly between cases and controls
Mandal 2013 [30]	N=42 confirmed IMD (n=7) and matched controls (n=35)	Pub/nightclub visits	Proportion n (%): 6 (85.7) and 13 (37.1) Attends bars in cases and controls, respectively; OR (95% CI) (cases vs. controls): 8.06 (1.12-∞); (mOR, 8.06; P = 0.04)	A significantly greater proportion of cases attend bars than controls. There is inequality in IMD risk due to behaviours of 'attending bars' in university students.
Mandal 2013 [30]	N=42 confirmed IMD (n=7) and matched controls (n=35)	Pub/nightclub visits	Proportion n (%): 7 (100) and 30 (85.7) Attends parties in cases and controls, respectively; OR (95% CI) (cases vs. controls): 1.78 (0.13-∞)	Proportion of cases and controls that attend parties did not differ significantly
Mandal 2013 [30]	N=42 confirmed IMD (n=7) and matched controls (n=35)	Illegal drug use	Proportion n (%): 3 (42.9) and 10 (28.6) Uses marijuana in cases and controls, respectively; OR (95% CI) (cases vs. controls): 1.85 (0.23-12.81)	Proportion of marijuana use did not differ significantly between cases and controls
Ridpath 2015 [25]	N=68 MSM with outbreak MenC (n=17) vs MSM with no IMD (n=51)	Illegal drug use	Matched OR (95% CI): 0.5 (0.1–2.4); 16.6 (3.1–∞) ($p<0.05$) and 11.2 (1.8– ∞) ($p<0.05$) for use of marijuana, methamphetamine and cocaine in month before illness onset, respectively	Use of methamphetamine and cocaine was significantly associated with the risk of IMD incidence in this cohort of MSM individuals. Hence, there is an inequality in IMD incidence by illegal drug usage.
Mandal 2013 [30]	N=42 confirmed IMD (n=7) and matched controls (n=35)	Kissing	Proportion n (%): 4/6 (66.7) and 8 (22.9) >1 kissing partner in cases and controls, respectively; OR (95% CI) (cases vs. controls): 13.66 (1.23-708.7); (mOR, 13.66; P = 0.03)	The proportion of cases having more than 1 kissing partner was significantly greater than for controls. There is inequality in IMD risk due to behaviors of '>1 kissing partner' in university students.
Ridpath 2015 [25]	N=68 MSM with outbreak MenC (n=17) vs MSM with no IMD (n=51)	Immuno-suppression status	Proportion of patients n (%) HIV-Infected: 10/17 (58.8) in cases; 13/51 (25.5) in controls	Numerically, higher proportion of cases were HIV-infected than controls. There is an inequality in IMD cases by immunosuppressive status.

Table S6. Inequalities in IMD mortality by individual characteristics/behaviors

Author Year	**Patients**	**Exposure**	**IMD mortality**	**Interpretation of impact on inequality**
Bloch 2018 [20]	N=151 aged ≥15y with IMD	Age	Adjusted risk ratio (95% CI): 15-24 years: 0.61 (0.27-1.34); p >0.05 25-44 years: Ref 45-64 years: 0.79 (0.40-1.56); p >0.05 ≥65 years: 0.55 (0.24-1.22); p>0.05	Age was not associated with IMD mortality
Bloch 2018 [20]	N=151 aged ≥15y with IMD	Sex /sexual orientation	Adjusted risk ratio (95% CI): Male: Ref Female: 2.14 (1.19-3.84); p<0.05	Adjusted risk ratio for mortality was significantly higher in females compared to males. Hence, there is inequality in IMD mortality due to sex.

Bloch 2018 [20]	N=147 aged ≥15y with IMD	Sex /sexual orientation	Adjusted risk ratio (95% CI): Male: Ref Female: 13.70 (3.23-58.05); p<0.05	Among those with meningitis, females had significantly higher mortality than males. There is an inequality in IMD meningitis mortality due to sex.
Bloch 2018 [20]	N=151 aged ≥15y with IMD	Ethnicity/ Race	Adjusted risk ratio (95% CI): Non-Hispanic White: Ref Non-Hispanic Black: 1.46 (0.72-2.93); p>0.05 Hispanic: 0.74 (0.34-1.59); p>0.05 Asian/Pacific Islander: 1.24 (0.33-4.63); p>0.05 Unknown/other: 1.09 (0.34-3.47); p>0.05	Race/ethnicity was not associated with IMD mortality.
Folaranmi 2017 [29]	N=527 MSM and non-MSM with IMD	Sex /sexual orientation	Proportion of individuals n (%) MSM: 24 (32.4) Non-MSM: 90 (23.5) p=0.112	Mortality was not significantly different between the MSM and non-MSM group.
Blain 2021 [19]	N=34 IMD patients previously vaccinated with MenACWY (aged 12-62 years)	Immuno-suppression status	Mortality proportion n (%) Immunosuppressed: 1 (13) Not known to be immunosuppressed: 4 (15); p=NS	No significant difference in case fatality ratio between previously vaccinated immunosuppressed patients and patients not known to be immunosuppressed.

Table S7. Inequalities in IMD carriage by individual characteristics/behaviors

Author Year	**Patients**	**Exposure**	**IMD carriage**	**Interpretation of impact on inequality**
Harrison 2015 [23]	N=3,311 high school students	Age	Carriage rate: 8.0% of students in grades 11 or 12, compared with 3.4% in grades 9 or 10 (P < .0001); older age (OR, 1.3; 95% CI, 1.2–1.5)	Positive association was found between carriage rate and students in higher grades. Per unit increase in age increases the risk of being a carrier by 1.3 times There is an inequality in carriage rate due to age
Breakwell 2018 [56]	N=1,837 undergraduate students	Age	Prevalence ratios (95% CI) (median increase of age in years): 1.00 (0.98-1.03); p=0.75	There was no association between IMD carriage and median increase in age.
McNamara 2017 [55]	N=4,225 healthy participants	Age	Prevalence ratio (95% CI): 18 years: Ref 19 years: 1.2 (0.9-1.6); p=0.3 20 years: 1.6 (1.1-2.3); p=0.02 21 years: 1.1 (0.7-1.8); p= 0.7 22 years: 0.8 (0.5-1.5); p=0.6 23-29 years: 0.8 (0.4-1.5); p=0.5 30+ years: 1.8 (0.7-5.2); p=0.4	Participants 20 years of age had significant higher prevalence ratio of carriage than at 18 years. There is an inequality in carriage rate as per age category.

McNamara 2017 [55]	N=4,225 healthy participants	Age	Prevalence ratio (95% CI): 18 years: Ref 19 years: 2.0 (0.9-4.6); p=0.09 20 years: 2.2 (0.9-5.6); p=0.1 21 years: 0.9 (0.3-3.0); p=0.9 22 years: 2.6 (0.9-7.4); p=0.1	There was no association between MenB carriage rate and age.
Breakwell 2018 [56]	N=1,837 undergraduate students	Sex /sexual orientation	Adjusted prevalence ratios (95% CI) (male vs. female): 1.66 (1.29-2.14); p<0.01	Prevalence of IMD carriage is significantly greater in males than females indicating an inequality between sexes.
McNamara 2017 [55]	N=4,225 healthy participants	Sex /sexual orientation	Prevalence ratio (95% CI): Female: Ref Male: 1.2 (1.0-1.5); p=0.03	Males had significantly higher carriage prevalence rate than females. There is an inequality in carriage rate between sexes.
McNamara 2017 [55]	N=4,225 healthy participants	Sex /sexual orientation	Prevalence ratio (95% CI): Female: Ref Male: 1.0 (0.6-1.6); p=0.9	There was no association between MenB carriage rate and sex.
Harrison 2015 [23]	N=3,311 high school students	Ethnicity/Race	Carriage rate: 8% White race vs. 2.1% other races (P < .0001); [OR], 3.2; 95% CI, 2.1–4.9	Positive correlations were reported between race and carriage rate: Participants from White race had significantly 3.2 times higher carriage rate compared to other races. Race was a risk factor for IMD carriage. There is an inequality in carriage rate due to race in high school students
Harrison 2015 [23]	N=3,311 high school students	Smoking	Carriage rate: 12.1% of current smokers, compared with 5.0% of non-smokers (P < .0001); being a current smoker (OR, 1.6; 95% CI, 1.1–2.4)	Positive association was reported between carriage rate and being a current smoker. Smokers had significantly 1.6 times higher carriage rates compared to non-smokers. Smoking was a risk factor for IMD carriage. There is an inequality in carriage rate due to smoking status
Breakwell 2018 [56]	N=1,837 undergraduate students	Smoking	Adjusted prevalence ratios (95% CI): No tobacco or marijuana use in the past 30 days: Ref Tobacco or marijuana use in past 30 days: 1.53 (1.21-1.94); p<0.01	Tobacco/marijuana use in the past 30 days was significantly associated with adjusted carrier prevalence ratio. There is an inequity in carriage prevalence ratio as per smoking behaviour.
Breakwell 2018 [56]	N=1,837 undergraduate students	Smoking	Adjusted prevalence ratios (95% CI): No second-hand smoke exposure in the past 30 days: Ref Second-hand smoke exposure in the past 30 days: 1.17 (0.91-1.51); p=0.23	There was no association between carriage prevalence ratio and exposure to second-hand smoke.
McNamara 2017 [55]	N=4,225 healthy participants	Smoking	Prevalence ratio (95% CI): No: Ref Yes: 1.4 (1.2-1.7); p= 0.0008	Smokers had significantly higher carriage rate than non-smokers. There is an inequality in carriage rate as per smoking status.

McNamara 2017 [55]	N=4,225 healthy participants	Smoking	Prevalence ratio (95% CI): Never: Ref Some days: 1.1 (0.9-1.3); p=0.4 Every day: 1.2 (0.8-1.7); p=0.4	There was no association between exposure to second-hand smoke and IMD carriage.
McNamara 2017 [55]	N=4,225 healthy participants	Smoking	Prevalence ratio (95% CI): No: Ref Yes: 2.0 (1.1-3.6); p=0.02	Smokers had significantly higher MenB carriage rate than non-smokers. There is an inequality in MenB carriage rate as per smoking status.
McNamara 2017 [55]	N=4,225 healthy participants	Smoking	Prevalence ratio (95% CI): Second-hand smoke Never: Ref Some days: 1.3 (0.8-2.0); p=0.3 Every day: 1.6 (0.6-4.1); p=0.5	There was no association between MenB carriage rate and exposure to second-hand smoke.
Breakwell 2018 [56]	N=1,837 undergraduate students	Pub/nightclub visits	Adjusted prevalence ratios (95% CI): Frequents bars/parties <1 time/week: Ref Frequents bars/parties ≥1 time/week: 2.03 (1.52-2.72); p<001	There was a positive correlation of IMD carriage with frequency of visiting bar/parties. Adjusted carrier prevalence ratio was significantly higher in participants visiting bar/parties ≥1 time/week, hence, there is an inequity in carriage prevalence ratio as per social gathering behaviour (attending bars/parties).
McNamara 2017 [55]	N=4,225 healthy participants	Pub/nightclub visits	Prevalence ratio (95% CI): <1/week or never: Ref 1/week: 2.0 (1.6-2.5); p<0.0001 2–3/week: 2.8 (2.2-3.6); p<0.0001 ≥4/week: 2.7 (1.6-4.4); p=0.01	Participants attending bars, clubs, parties had significantly higher carriage rate than those attending <1/week/never. There is an inequality in carriage rate as per frequency of social outings.
McNamara 2017 [55]	N=4,225 healthy participants	Pub/nightclub visits	Prevalence ratio (95% CI): <1/week or never: Ref 1/week: 1.3 (0.7-2.4); p=0.5 2–3/week: 2.3 (1.1-1.46); p=0.04 ≥4/week: 3.0 (0.9-9.7); p=0.2	Attending bars/clubs/parties 2-3 times a week had significantly higher MenB carriage prevalence rate than other categories. There is an inequality in MenB carriage rate as per frequency of social outings.

Table S8. Inequalities in IMD mortality by socioeconomic factors

Author Year	**Patients**	**Exposure**	**IMD mortality**	**Interpretation of impact on inequality**
Bloch 2018 [20]	N=151 aged ≥15y with IMD	Social deprivation	Adjusted risk ratio (95% CI): Neighborhood poverty level 0-<10%: Ref 10%-<20%: 1.43 (0.60-3.41); p>0.05 20%-<30%: 1.70 (0.62-4.70); p>0.05 30%-100%: 1.86 (0.71-4.86); p>0.05	IMD-related mortality was not associated with neighborhood poverty level.
Mbaeyi 2019 [31]	N=163 confirmed/ probable IMD in students (ages 18-24y)	Education level	Mortality proportion: 10 (13%) in college students vs. 9 (11.8%) in non-college students	No difference observed in the proportion who died between college and non-college groups.
Rudmann 2022 [28]	PEH and not known to be experiencing homelessness (non-PEH) with IMD Ages <18 or ≥18y	Homelessness	Mortality n (%): 2 (4.4%) in PEH cohort vs. 166 (12.5%) in non-PEH cohort; p=NS	Case fatality ratio (CFR) was not significantly different between the two groups although the CFR among PEH was less than half of that among non-PEH.

Table S9. Inequalities in IMD incidence by socioeconomic factors

Author Year	Patients	Included in the Analysis	Specific Exposure	Summary Statistic: Analysis Type, Statistical Data	Interpretation of impact on Inequality
Krishnarajah, 2014 [21]	Adult Medicaid and commercially insured populations (from 2006 to 2010, aged within the range of 19-64 years)	Medicaid: 1,658,054 Commercial: 2,800,0862	Insurance status and type	Mean incidence proportion (per 100,000) for year 2006-2010: 14.7 (95% CI: 13.9-15.6) for Medicaid vs. 2.2 (95% CI: 2.2-2.3) for Commercial Medicaid 2006: 8.2 (95% CI: 7.1-9.6) 2007: 12.8 (95% CI: 11.0-14.8) 2008: 21.1 (95% CI: 18.9-23.6) 2009: 14.9 (95% CI: 13.1-16.8) 2010: 18.1 (95% CI: 16.1-20.3) Commercial 2006: 1.6 (95% CI: 1.4-1.8) 2007: 2.3 (95% CI: 2.2-2.5) 2008: 2.3 (95% CI: 2.1-2.5) 2009: 2.8 (95% CI: 2.6-3) 2010: 2.1 (95% CI: 2-2.3)	Medicaid population had a numerically higher incidence of meningococcal disease compared to the commercial population. There is inequality due to type of insurance on the incidence proportion of meningococcal cases.
Krishnarajah, 2014 [21]	Adult Medicaid and commercially insured populations (from 2006 to 2010, aged within the range of 19-64 years)	Medicaid: 1,629,543 Commercial: 32,929,132	Insurance status and type	Mean Incidence proportion (95% CI) (per 100,000) for year 2010: 26.2 (95% CI: 22.9-29.8) for Medicaid vs. 2.0 (95% CI: 1.9-2.2) for Commercial; p<0.001	Incidence of meningococcal disease was significantly higher in Medicaid population. There is inequality due to type of insurance on the incidence proportion of meningococcal cases.
Ridpath, 2015 [25]	Men who have sex with men (MSM) with outbreak-related serogroup C meningococcal disease (cases) and MSM without meningococcal disease (controls)	68 (17 cases, 51 controls)	Insurance status and type	Proportion of individuals n (%) Health insurance: yes: 9/14 (64.3) in cases; 48/51 (94.1) in controls	Numerically, lower proportion of cases were insured than the controls indicating that those who can afford insurance are less likely to get IMD. There is an inequality in IMD cases by insurance status.
Ridpath, 2015 [25]	Men who have sex with men (MSM) with outbreak-related serogroup C	68 (17 cases, 51 controls)	Education level	Proportion of individuals n (%) High school, GED or less: 5/15 (33.3) in cases; 5/50 (10.0) in controls	Numerically, greater proportion of cases had education level of high school, GED or less, and fewer cases were in the college group than

	meningococcal disease (cases) and MSM without meningococcal disease (controls)			At least some college: 10/15 (66.7) in cases; 45/50 (90.0) in controls	controls. There is an inequality in IMD cases by education level.
Mandal, 2013 [30]	Confirmed meningococcal disease (cases) and matched controls	42 (7 cases, 35 controls)	Education level	Proportion n (%): 2 (28.6) and 16 (45.7) Honours student, GPA ≥ 3.5 in cases and controls, respectively; OR (95% CI) (cases vs. controls): 0.45 (0.03-3.58)	Proportion of honours students did not differ significantly between cases and controls
Mbaeyi, 2019 [31]	All confirmed and probable meningococcal cases in students aged 18-24 years	163	Education level (stratified by age and serogroup)	Relative risk: All cases (college students vs. non-college students) 18 to 24 years: 1.67 18 to 19 years: 2 20 to 21 years: 1.42 22 to 24 years: 0.36 Serogroup B (college students vs. non-college students) 18 to 24 years: 3.54 18 to 19 years: 3.1 20 to 21 years: 4.14 22 to 24 years: 0.28 Serogroups C, W or Y (college students vs. non-college students) 18 to 24 years: 0.56 18 to 19 years: 2.76 20 to 21 years: 0.48 22 to 24 years: 0.16 Average annual incidence (cases per 100,000 population) All cases 18 to 24 years: 0.2315 for college student vs. 0.1384 for non-college students Stratified by age groups: 18 to 19 years: College students: 0.3777 Non-college students: 0.1888 20 to 21 years: College students: 0.2333 Non-college students: 0.1639 22 to 24 years:	College students were at an increased numerical risk for meningococcal disease compared with non-college students aged 18 to 24 years, especially in serogroup B cases. There is an inequality in incidence of IMD in freshman college students and non-college students

				College students: 0.0393 Non-college students: 0.1077 Stratified by serogroup and age: Serogroup B 18 to 24 years College students: 0.1673 Non-college students: 0.0485 18 to 19 years College students: 0.2795 Non-college students: 0.0903 20 to 21 years College students: 0.1770 Non-college students: 0.0428 22 to 24 years College students: 0.0098 Non-college students: 0.0348 Serogroups C, W or Y 18 to 24 years College students: 0.0279 Non-college students: 0.0502 18 to 19 years College students: 0.0453 Non-college students: 0.0164 20 to 21 years College students:0.0241 Non-college students: 0.0499 22 to 24 years College students: 0.0098 Non-college students: 0.0634	
Mandal, 2013 [30]	Confirmed meningococcal disease (cases) and matched controls	42 (7 cases, 35 controls)	Education level of parents in the case of minors	Proportion n (%): 6/6 (100) and 28 (80) Parental college education in cases and controls, respectively; OR (95% CI) (cases vs. controls): 2.41 (0.27-∞)	% of parents with a college education was not significantly different between cases and controls.
Ridpath, 2015 [25]	Men who have sex with men (MSM) with outbreak-related serogroup C meningococcal disease (cases) and MSM without	68 (17 cases, 51 controls)	Unemployment and job security	Proportion of individuals n (%) Employed: 12/17 (70.6) in cases; 41/51 (80.4) in controls	The proportion of cases and controls in the employed group did not differ.

	meningococcal disease (controls)				
Ridpath, 2015 [25]	Men who have sex with men (MSM) with outbreak-related serogroup C meningococcal disease (cases) and MSM without meningococcal disease (controls)	68 (17 cases, 51 controls)	Wealth	Proportion of individuals n (%) Annual household income: <$29,999: 9/13 (69.3) in cases; 15/46 (32.6) in controls $30,000 – 59,999: 3 /13 (23.1) in cases; 8/46 (17.4) in controls >$60,000: 1/13 (7.7) in cases; 23/46 (50.0) in controls	A numerically greater proportion of cases than controls in the <$29,999; but also, there is a numerically smaller proportion of cases than controls in the >$60,000. There is an inequality in IMD cases by annual household income level.
Rudmann, 2022 [28]	PEH and not known to be experiencing homelessness (non-PEH) with IMD aged either less than or more than or equal to 18 years	1409	Homelessness (overall and stratified by age subgroup)	Estimated incidence (per 100,000): 2.12 in people experiencing homelessness (PEH) vs. 0.11 in non-PEH; RR (95% CI): 19.8 (14.8-26.7) Sporadic case incidence (per 100,000): 1.27 in PEH vs. 0.10 in non-PEH; RR (95% CI): 12.8 (8.8-18.8) Estimated incidence in adults aged 18 and older (per 100,000): 2.54 in PEH vs. 0.10 in non-PEH; RR (95% CI): 24.6 (18.1- 33.3) Sporadic case incidence in adults aged 18 and older (per 100,000): 1.60 in PEH vs. 0.09 in non-PEH; RR (95% CI): 16.8 (11.5- 24.7)	IMD incidence risk was higher in the PEH cohort than non-PEH. The risk was also higher in the adult PEH cohort. There is inequity in IMD risk among PEH compared with non-PEH.
Mandal, 2013 [30]	Confirmed meningococcal disease (cases) and matched controls	42 (7 cases, 35 controls)	Organisation/community	Proportion n (%): 3 (42.9) and 1 (2.9) Greek society member; OR (95% CI) (cases vs. controls): 15 (1.2-787.5); p = 0.03	A significantly greater proportion of cases had Greek society membership than controls. There is an inequality for students with Greek society membership.
Mandal, 2013 [30]	Confirmed meningococcal disease (cases) and matched controls	42 (7 cases, 35 controls)	Organisation/community	Proportion n (%): 3 (42.9) and 8 (22.9) Sports team member in cases and controls, respectively; OR (95% CI) (cases vs. controls): 2.18 (0.31-13.54)	% of individuals who are part of a sports team was not significantly different between cases and controls.
Mandal, 2013 [30]	Confirmed meningococcal disease (cases) and matched controls	42 (7 cases, 35 controls)	Organisation/community	Proportion n (%): 1 (14.3) and 13 (37.1) Other club member (e.g., academic/literary/performing arts) in cases and controls, respectively; OR (95% CI) (cases vs. controls): 0.30 (0.006-2.8)	% of individuals having another club membership was not significantly different between cases and controls

Table S10. Inequalities in IMD carriage by socioeconomic factors

Study Name Author, Year	Brief Patient Characteristics	Included in the Analysis	Specific Exposure	Summary Statistic: Analysis Type, Statistical Data	Interpretation of Impact on Inequality
McNamara, 2017 [55]	Healthy participants (to assess carriage rate)	4,225	Education level	Prevalence ratio (95% CI): Freshman: Ref Sophomore: 0.8 (0.6-1.1); p=0.2 Junior: 0.7 (0.5-1.1); p=0.2 Senior: 0.8 (0.5-1.4); p=0.5	There was no association between year in school and carriage prevalence.
McNamara, 2017 [55]	Healthy participants (to assess carriage rate)	4,225	Education level	Prevalence ratio (95% CI): Freshman: Ref Sophomore: 1.6 (0.9-2.8); p=0.09 Junior: 0.9 (0.5-1.8); p=0.8 Senior: 1.3 (0.7-2.3); p=0.4	There was no association between MenB carriage rate and education level.
Breakwell, 2018 [56]	Undergraduate students tested for meningococcal carriage	1,837	Education level	Prevalence ratios (95% CI) (Freshman as reference): Sophomore: 1.19 (0.84-1.70); p=0.32 Junior: 1.01 (0.69-1.47); p=0.97 Senior: 1.07 (0.76-1.52); p=0.69	There was no association between IMD carriage and education level.

Table S11. Inequalities in IMD mortality by environmental factors

Study Name Author, Year	Brief Patient Characteristics	Included in the Analysis	Specific Exposure	Summary Statistic: Analysis Type, Statistical Data	Interpretation of Impact on Inequality
Mbaeyi, 2019 [32]	Cases of meningococcal disease (sporadic and outbreak-associated) aged <1-≥65 years	180	Organisation/ community	Mortality n (%): 13 (19.1%) in organisation cases; 30 (27.3%) in community cases	Numerically, higher number of individuals died in community-based outbreaks as compared to organisation-based ones. There was inequality reported for IMD mortality.

Table S12. Inequalities in IMD incidence by environmental factors

Study Name Author, Year	Brief Patient Characteristics	Included in the Analysis	Specific Exposure	Summary Statistic: Analysis Type, Statistical Data	Interpretation of Impact on Inequality
Mbaeyi, 2019 [32]	Cases of meningococcal disease (sporadic and outbreak-associated) aged <1-≥65 years	68	Organisation/community	Median number (range) of cases in outbreaks: 3 (2-10) for university; 3 (2-8) for other organisation	Similar numbers of meningococcal cases were observed across both university and other organisation type outbreaks.
Mandal, 2013 [30]	Confirmed meningococcal disease (cases) and matched controls	42 (7 cases, 35 controls)	Housing and household size	Proportion n (%): 7 (100) and 34 (97.1) lived in a residence hall in cases and controls, respectively; OR (95% CI) (cases vs. controls): 0.20 (0.005-∞)	Proportion of students living in a residence hall did not differ significantly between cases and controls
Ridpath, 2015 [25]	Men who have sex with men (MSM) with outbreak-related serogroup C meningococcal disease (cases) and MSM without meningococcal disease (controls)	68 (17 cases, 51 controls)	Housing and household size	Matched OR (95% CI): 3.7 (1.0–18.0) for household with >1 other person	Household size was not associated with risk of infection.
Ridpath, 2015 [25]	Men who have sex with men (MSM) with outbreak-related serogroup C meningococcal disease (cases) and MSM without meningococcal disease (controls)	68 (17 cases, 51 controls)	Geographic location/region	Proportion of individuals n (%) Brooklyn: 9/16 (56.3) in cases; 11/51 (21.6) in controls Manhattan: 5/16 (31.3) in cases; 30/51 (58.8) in controls Queens or Bronx: 2/16 (11.8) in cases; 10/51 (19.6) in controls	Numerically, the proportion of cases was highest in Brooklyn. There is an inequality in IMD cases by geographic area.
Folaranmi, 2017 [29]	Men who have sex with men (MSM) and non-MSM having meningococcal disease	527	Geographic location/region	RR (95% CI) (MSM vs. Non-MSM): Geography subgroup New York City: 15.2 (8.3-27.8); p<0.001 Los Angeles County: 14.6 (6.8-31.1); p<0.001 Chicago: 31.8 (9.8-103.3); p<0.001	Incidence of IMD in MSM was significantly greater than non-MSM across US cities. This suggests inequalities in IMD incidence between MSM and non-MSM is not influenced by geography.

Table S13. Inequalities in IMD carriage by environmental factors

Study Name Author, Year	Brief Patient Characteristics	Included in the Analysis	Specific Exposure	Summary Statistic: Analysis Type, Statistical Data	Interpretation of Impact on Inequality
Breakwell, 2018 [56]	Undergraduate students tested for meningococcal carriage	1,837	Housing and household size	Adjusted prevalence ratios (95% CI): Does not live in residence hall: Reference Lives in residence hall: 0.85 (0.66-1.10); p= 0.23	There was no association between IMD carriage and living in halls of residence.
McNamara, 2017 [55]	Healthy participants (to assess carriage rate)	4,225	Housing and household size	Prevalence ratio (95% CI): On-campus: Ref Off-campus: 1.3 (0.7-2.2); p=0.4	There was no association between living on/off-campus and carriage prevalence.
McNamara, 2017 [55]	Healthy participants (to assess carriage rate)	4,225	Housing and household size	Prevalence ratio (95% CI): Residence hall: Ref Apartment/house: 0.9 (0.5-1.8); p=0.8 Sorority/fraternity: 1.3 (0.7-2.4); p=0.4	There was no association between housing type and carriage prevalence.
McNamara, 2017 [55]	Healthy participants (to assess carriage rate)	4,225	Housing and household size	Prevalence ratio (95% CI): On-campus: Ref Off-campus: 1.2 (0.8-1.9); p=0.4	There was no association between MenB carriage rate and living on- vs. off-campus.
McNamara, 2017 [55]	Healthy participants (to assess carriage rate)	4,225	Housing and household size	Prevalence ratio (95% CI): Residence hall: Ref Apartment/house: 1.4 (0.8-2.2); p=0.2 Sorority/fraternity: 2.0 (0.8-5.2); p=0.2	There was no association between MenB carriage rate and types of residence.
McNamara, 2017 [55]	Healthy participants (to assess carriage rate)	4,225	Sharing bed/room	Prevalence ratio (95% CI): Number of roommates 0: Ref 1: 1.0 (0.7-1.4); p=1.0 2: 1.0 (0.7-1.5); p=1.0 3+: 1.2 (0.8-1.7); p=0.3 Live with family: 0.6 (0.3-1.4); p=0.2	There was no association between number of roommates and carriage prevalence.
McNamara, 2017 [55]	Healthy participants (to assess carriage rate)	4,225	Sharing bed/room	Prevalence ratio (95% CI): Roommates 0: Ref 1: 1.3 (0.5-3.7); p=0.6 2: 0.7 (0.2-2.7); p=0.7 3+: 1.5 (0.5-4.1); p=0.4	There was no association between MenB carriage rate and number of roommates.

Table S14. Inequalities in IMD prevention

Study Name Author, Year	Brief Patient Characteristics	Included in the Analysis	IMD Outcome	Exposure	Specific Exposure	Summary Statistic: Analysis Type, Statistical Data	Interpretation of Impact on Inequality
Basta, 2019[27]	Parents of teens attending high school in 2017-2018	445	Willingness to vaccinate	Person's individual characteristics and behaviours	Childhood development	OR (95% CI): 1) Willingness to vaccinate their child with MenB vaccine Parents who were aware of at least one of the MenB vaccines compared with those who were not aware: 3.8 (1.2-12.2); p=0.03 Participants who were at least somewhat concerned about meningococcal disease compared to those not at all concerned: 3.1 (1.5-6.3); p=0.002 2) Willingness to vaccinate their child with MenACWY vaccine Parents who were aware of at least one of the MenACWY vaccines compared with those who were not aware: 6.3 (1.3-29.4); p=0.002 Participants who were at least somewhat concerned about meningococcal disease compared to those not at all concerned: 3.9 (1.8-8.4); p<0.001 3) Willingness to fully vaccinate their child Parents who were aware of at least one of the vaccines compared with those who were not aware: 1.9 (1.1-3.2); p=0.02 Participants who were at least somewhat concerned about meningococcal disease compared to those not at all concerned: 2.0 (1.3-3.2); p=0.002	Inequality in willingness to vaccinate child as per parental vaccine/disease awareness; Parents who were aware of at least one of the MenB/MenACWY vaccines compared with those who were not aware or who were at least somewhat concerned about meningococcal disease compared to those not at all concerned had significantly higher odds of being willing to vaccinate their child with MenB vaccine, with MenACWY vaccine and with enough doses to fully vaccinate their child.
Cheng, 2020[26]	Adolescents aged 17 years	Unweighted: 22,928	Vaccine uptake (completion)	Person's individual characteristics and behaviours	Gender identity/sexual orientation	OR (95% CI): Male: Reference Female: 0.63 (0.56-0.71); p <0.001	Adolescents of female sex had significantly lower odds of series completion which indicates inequality in the completion rate of MenACWY primary and booster dose due to sex.

		Weighted: 3,948,025	Vaccine uptake (completion)	Person's individual characteristics and behaviours	Ethnicity/Race	OR (95% CI): Non-Hispanic White: Reference Non-Hispanic Black: 1.3 (1.05-1.61); p=0.016 Non-Hispanic other: 1.37 (1.09-1.71); p=0.006 Hispanic: 1.16 (1.02-1.32); p=0.024	Significantly higher odds of series completion were found among adolescents who were Hispanic, non-Hispanic Black and non-Hispanic other race compared to non-Hispanic White indicates inequality as per ethnicity/race.
			Vaccine uptake (completion)	Physical environment	Geographic location/region	Proportion (%) Northeast: 28.7 Midwest: 24.7 South: 19.6 West: 23.5 P=NR	No analyses were performed; however, the difference was reported numerically. Among Census regions, the lowest MenB vaccine coverage was in the South and the highest in the Northeast which indicates inequality as per region.
			Vaccine uptake (completion)	Social and economic factors	Insurance status and type	Proportion (%) Private only: 24.8 Any Medicaid: 23.8 Other: 20.9 Uninsured: 11.1	No analyses were performed; however, the difference was reported numerically. Lower vaccination completion rate was observed among uninsured adolescents which indicates inequity.
			Vaccine uptake (completion)	Social and economic factors	Marital status	OR (95% CI): Mother's marital status; married: 1.14 (1.01-1.28); p=0.035 Mother's marital status; not married: Reference	Significantly higher odds of series completion were found among adolescents who had married mothers which indicates inequality due to marital status in the completion rate
			Vaccine uptake (completion)	Social and economic factors	Number of children <18 in household	OR (95% CI): Number of children <18 in household (ref.: 1) 2-3: 1.14 (1.03-1.27); p=0.013 ≥4: 1.14 (0.97-1.34); p=0.102	Significantly higher vaccination completion rate was observed in households with 2-3 <18-year-olds than households with 1 <18-year-olds which indicates inequality in vaccine completion rate.
			Vaccine uptake (completion)	Social and economic factors	Wealth	OR (95% CI): Family income: ≤$30,000: Reference $30,001-$75,000: 1.05 (0.92-1.2); p=0.487 >$75,000: 1.21 (1.02-1.45); p=0.033	Significantly higher odds of series completion were found among adolescents who had family income >$75,000. There is an inequity due to family income in the completion rate of MenACWY primary and booster dose.
			Vaccine uptake (completion)	Person's individual characteristics and behaviours	Access to care (Number of visits to healthcare professional in the past year)	OR (95% CI): Number of visits to healthcare professional in the past year: None: Reference 1: 1.36 (1.11-1.67); p=0.003 2-5: 1.52 (1.25-1.85); p<0.001 ≥6: 1.44 (1.1-1.88); p=0.008	Significantly higher odds of series completion were found among adolescents who had one or more visits to the healthcare professional in the past year compared to none.
			Vaccine uptake (completion)	Physical environment	Geographic location/region	Proportion (%)	No analyses were performed; however, the difference was reported numerically. Higher

						Residence in a state with one-dose vaccination mandate by age 15; Yes: 30.3 Residence in a state with one-dose vaccination mandate by age 15; No: 20.2	vaccine completion rate was observed among adolescents residing in a state with one-dose vaccination mandate by age 15 which indicates inequity.
			Vaccine uptake (completion)	Physical environment	Geographic location/region	OR (95% CI): Residence in a state with booster dose vaccination mandate by age 17; Yes: 2.08 (1.48-2.93); p <0.001 Residence in a state with booster dose vaccination mandate by age 17; No: Reference	Significantly higher vaccine compliance rate was observed among adolescents residing in a state with booster dose vaccination mandate by age 17 which indicates inequality based on state mandate.
			Vaccine uptake (completion)	Social and economic factors	Healthcare expenditure	OR (95% CI): Paediatricians per 10,000 population ages 0–18 (per 10-unit increase) 0 to <7.6 (1st quartile)): ref 7.6 to <8.9 (2nd quartile): 1.08 (0.75–1.57); p=0.664 8.9 to <11.8 (3rd quartile): 1.39 (0.89–2.18); p=0.151 11.8 to <56.5 (4th quartile): 1.69 (1.16–2.46); p=0.007	Significantly higher completion rate when there are more paediatricians per 10,000 population ages 0–18 (per 10-unit increase) which indicates in inequality.
			Vaccine uptake (completion)	Person's individual characteristics and behaviours	Access to care	OR (95% CI): Whether teen had a 11–12-year-old well-child exam (ref.: No) Yes: 1.41 (1.14–1.76); p=0.002	Significantly higher completion rate when teen had a 11–12-year-old well-child exam; which indicates inequality in vaccine completion rate.
			Vaccine uptake (completion)	Person's individual characteristics and behaviours	Comorbidity	Proportion (%) Asthma history Yes: 25.9 No: 22.5	Children with a history of asthma had numerically higher vaccination completion rate than those without a history of asthma (no stats performed); which indicates numerical inequality.
			Vaccine uptake (completion)	Person's individual characteristics and behaviours	Comorbidity	Proportion (%) Any high-risk health conditions Yes: 25.5 No: 23.0	Children with any high-risk health conditions had numerically higher vaccination completion rate than those without (no stats performed) which indicates numerical inequality in completion rate.
			Vaccine uptake (completion)	Person's individual characteristics and behaviours	Comorbidity	OR (95% CI): Any high-risk health conditions among household members (ref.: No) Yes 0.90 (0.79-1.01); p=0.083	No association of vaccine completion rate with presence of high-risk health conditions among household members.
			Vaccine uptake (completion)	Social and economic factors	Type of healthcare (Facility type	OR (95% CI): Facility type of vaccine providers (ref: Public) Private: 1.56 (1.29–1.90); p<0.001 Hospital: 1.42 (1.10–1.83); p=0.007	Significantly higher completion rate for private, hospital, other/mixed/unknown compared to public provider. There is an inequity in vaccination completion rate.

					of vaccine providers)	Other/Mixed/Unknown: 1.49 (1.24–1.78); p<0.001	
			Vaccine uptake (completion)	Social and economic factors	Type of healthcare	OR (95% CI): Whether teen's providers report vaccinations to immunisation registry (ref: No providers) Some providers: 1.15 (0.86-1.55); p=0.354 All providers: 1.31 (1.11-1.55); p=0.002 Unknown: 1.11 (0.91-1.34); p=0.299	Significantly higher completion rate when all providers report vaccinations to immunisation registry compared to no providers which indicates inequality in vaccination completion.
			Vaccine uptake (completion)	Person's individual characteristics and behaviours	Access to care (Up-to-date Hep A vaccine)	OR (95% CI): Up-to-date Hep A vaccine Yes: 2.37 (2.07-2.71); p<0.001 No: ref	Significantly higher completion rate when teen had up-to-date Hep A vaccine which indicates inequality in completion rate.
			Vaccine uptake (completion)	Person's individual characteristics and behaviours	Access to care (Up-to-date Hep B vaccine)	OR (95% CI): Up-to-date Hep B vaccine Yes: 1.77 (1.16-2.69); p=0.008 No: Ref	Significantly higher completion rate when teen had up-to-date Hep B vaccine which indicates inequality in completion rate.
			Vaccine uptake (completion)	Person's individual characteristics and behaviours	Access to care (Up-to-date Varicella vaccine)	OR (95% CI): Up-to-date Varicella vaccine Yes: 1.39 (1.19-1.63); p<0.001 No: ref	Significantly higher completion rate when teen had up-to-date Varicella vaccine which indicates inequality in completion rate.
			Vaccine uptake (completion)	Person's individual characteristics and behaviours	Access to care (Up-to-date HPV vaccine)	OR (95% CI): Up-to-date HPV vaccine Yes: 2.77 (2.38-3.21); p<0.001 No: ref	Significantly higher completion rate when teen had up-to-date HPV vaccine which indicates inequality in completion rate.
			Vaccine uptake (completion)	Person's individual characteristics and behaviours	Access to care (Up-to-date Pneumococcal polysaccharide vaccine)	Proportion (%) Up-to-date Pneumococcal polysaccharide vaccine Yes: 39.3 No: 22.4	There is an inequality where a higher numerical vaccination completion rate is observed for teenagers who have up-to-date pneumococcal polysaccharide vaccination.
			Vaccine uptake (completion)	Person's individual characteristics and behaviours	Access to care (Up-to-date Tdap vaccine)	OR (95% CI): Up-to-date Tdap vaccine Yes: 3.03 (2.51-3.67); p<0.001 No: ref	Significantly higher completion rate when teen had up-to-date Tdap vaccine which indicates inequality in completion rate.
			Vaccine adherence/ Compliance	Person's individual characteristics and behaviours	Gender identity/sexual orientation	OR (95% CI): Male: Reference Female: 0.67 (0.6-0.76); p<0.001	Adolescents of female sex had significantly lower odds of compliance. There is inequality due to sex in the compliance rate of MenACWY primary and booster dose, where in adolescents of female sex had lower odds of compliance when compared to males.

			Vaccine adherence/ Compliance	Person's individual characteristics and behaviours	Ethnicity/Race	Proportion (%) Hispanic: 13.7 Non-Hispanic White: 11.6 Non-Hispanic Black: 11.6 Non-Hispanic other: 12.1; p=NR	No analyses were performed however, there was numerical difference. Higher vaccine compliance rate was observed among Hispanics when compared to other races/ethnic classes; inequality due to ethnicity/race
			Vaccine adherence/ Compliance	Physical environment	Geographic location/region	Proportion (%) Northeast: 16.1 Midwest: 11.2 South: 10.4 West: 12.7; p=NR	No analyses were performed however, there was numerical difference. Among Census regions, the lowest MenB vaccine compliance rate was in the South and the highest in the Northeast; inequality due to census region
			Vaccine adherence/ Compliance	Social and economic factors	Insurance status and type	OR (95% CI): Private only: Reference Any Medicaid: 1.05 (0.88-1.26); p=0.58 Other: 1.48 (1.22-1.79); p<0.001 Uninsured: 0.58 (0.4-0.85); p=0.005	Adolescents having other type of insurance had significantly higher likelihood of compliance, while those who were uninsured had a significantly lower likelihood of compliance compared to those who were privately insured which indicates inequality in compliance rate.
			Vaccine adherence/ Compliance	Social and economic factors	Marital status	Proportion (%) Mother's marital status; married: 12.5 Mother's marital status; not married: 11.4; p=NR	Lower vaccine compliance rate was observed among adolescents having unmarried mothers; however, no analyses was performed.
			Vaccine adherence/ Compliance	Social and economic factors	Number of children <18 in household	OR (95% CI): Number of children <18 in household (ref.: 1) 2-3: 1.12 (1.01-1.24); p= 0.031 ≥4: 1.05 (0.86-1.28); p= 0.622	Significantly higher odds of vaccination compliance in households with 2-3 < 18-year-olds compared to households with 1 18 year-old which indicates inequality in vaccine compliance rate.
			Vaccine adherence/ Compliance	Social and economic factors	Wealth	Proportion (%) Family income: ≤$30,000: 10.3 $30,001-$75,000: 10.6 >$75,000: 14.3; p=NR	Higher vaccine compliance rate was observed among adolescents having family income >$75,000; however, no analyses was performed.
			Vaccine adherence/ Compliance	Person's individual characteristics and behaviours	Access to care	Proportion (%) Number of visits to healthcare professional in the past year: None: 7.8 1: 13.1 2-5: 12.9 ≥6: 12.9; p=NR	Higher vaccine compliance rate was observed among adolescents who had made a single visit to the healthcare professional in the past year; however, no analyses was performed.

			Vaccine adherence/ Compliance	Physical environment	Geographic location/region	Proportion (%) Residence in a state with one-dose vaccination mandate by age 15; Yes: 17.8 Residence in a state with one-dose vaccination mandate by age 15; No: 9.7; p=NR	There is an inequality in vaccine compliance rate where a higher vaccine completion rate was observed among adolescents residing in a state with one-dose vaccination mandate by age 15.
			Vaccine adherence/ Compliance	Physical environment	Geographic location/region	Proportion (%) Residence in a state with booster dose vaccination mandate by age 17; Yes: 17 Residence in a state with booster dose vaccination mandate by age 17; No: 11.8; p=NR	Higher vaccine compliance rate was observed among adolescents residing in a state with booster dose vaccination mandate by age 17; however, no analyses was performed.
			Vaccine adherence/ Compliance	Person's individual characteristics and behaviours	Access to care	Proportion (%) Whether teen had a 11–12-year-old well-child exam Yes: 13.0 No: 5.2; p=NR	There is an inequality where teens who had a 11–12-year-old well-child exam had a higher vaccine compliance rate.
			Vaccine adherence/ Compliance	Person's individual characteristics and behaviours	Comorbidity	aOR (95% CI): Asthma history (ref.: No) Yes: 1.17 (1.00-1.37); p=0.044	There is an inequality where children with a history of asthma had a significantly higher vaccination compliance rate than those without a history of asthma
			Vaccine adherence/ Compliance	Person's individual characteristics and behaviours	Comorbidity	OR (95% CI): Any high-risk health conditions (ref.: No) Yes: 1.23 (0.98-1.54); p=0.08	No association between children with any high-risk health conditions and vaccination compliance rate. There is a numerical inequality where children with any high-risk health conditions had numerically higher vaccination completion rate than those without (not stats performed)
			Vaccine adherence/ Compliance	Person's individual characteristics and behaviours	Comorbidity	OR (95% CI): Any high-risk health conditions among household members (ref.: No) Yes: 0.84 (0.76-0.94); p=0.022	Significantly higher vaccination compliance if there are any high-risk health conditions among household members which indicates inequality.
			Vaccine adherence/ Compliance	Social and economic factors	Type of healthcare	OR (95% CI): Facility type of vaccine providers (ref: Public) Private: 1.81 (1.48-2.20); p<0.001 Hospital: 1.53 (1.21-1.93); p<0.001 Other/Mixed/Unknown: 1.46 (1.19-1.80); p<0.001	Significantly higher compliance rate for private, hospital, other/mixed/unknown compared to public provider which indicates inequality in vaccination compliance rate.
			Vaccine adherence/ Compliance	Social and economic factors	Type of healthcare	Proportion (%) Whether teen's providers report vaccinations to immunisation registry No providers: 10.1 Some providers: 10.3	There is an inequality where vaccination compliance is numerically higher where all providers report vaccinations to immunisation registry compared to no providers

						All providers: 13.7 Unknown: 10.4; p=NR	
			Vaccine adherence/ Compliance	Person's individual characteristics and behaviours	Access to care (Up-to-date Hep A vaccine)	OR (95% CI): Up-to-date Hep A vaccine Yes: 2.20 (1.87-2.59) No: ref; p <0.001	Significantly higher compliance rate when teen had up-to-date Hep A vaccine; There is an inequality where a higher vaccination completion rate is observed for teenagers who have up-to-date Hep A vaccination.
			Vaccine adherence/ Compliance	Person's individual characteristics and behaviours	Access to care (Up-to-date Hep B vaccine)	Proportion (%) Up-to-date Hep B vaccine Yes: 13.0 No: 4.0; p=NR	There is a numerical inequality where a higher vaccination completion rate is observed for teenagers who have up-to-date Hep B vaccination.
			Vaccine adherence/ Compliance	Person's individual characteristics and behaviours	Access to care (Up-to-date Varicella vaccine)	Proportion (%) Up-to-date Varicella vaccine Yes: 14.8 No: 4.2; p=NR	There is a numerical inequality where a higher vaccination completion rate is observed for teenagers who have up-to-date Varicella vaccination
			Vaccine adherence/ Compliance	Person's individual characteristics and behaviours	Access to care (Up-to-date HPV vaccine)	OR (95% CI): Up-to-date HPV vaccine Yes: 3.18 (2.82-3.6) No: ref; p <0.001	Significantly higher compliance rate when teen had up-to-date HPV vaccine; There is an inequality where a higher vaccination completion rate is observed for teenagers who have up-to-date HPV vaccination
			Vaccine adherence/ Compliance	Person's individual characteristics and behaviours	Access to care (Up-to-date Pneumococcal polysaccharide vaccine)	Proportion (%) Up-to-date Pneumococcal polysaccharide vaccine Yes: 25.0 No: 11.5; p=NR	There is a numerical inequality where a higher numerical vaccination completion rate is observed for teenagers who have up-to-date pneumococcal polysaccharide vaccination
			Vaccine adherence/ Compliance	Person's individual characteristics and behaviours	Access to care (Up-to-date Tdap vaccine)	OR (95% CI): Up-to-date Tdap vaccine Yes: 3.80 (2.75-5.25); p <0.001 No: ref	Significantly higher compliance rate when teen had up-to-date Tdap vaccine; There is an inequality where a higher vaccination completion rate is observed for teenagers who have up-to-date Tdap vaccination
			Vaccine adherence/ Compliance	Social and economic factors	Healthcare expenditure	OR (95% CI): Healthcare expenditures on physician and clinical services per capita (per $100-unit increase): 1.06 (0.99-1.12); p= 0.075	Higher numerical compliance rate when teen had a 11–12-year-old well-child exam; however, no association was found.
			Vaccine adherence/ Compliance	Social and economic factors	Type of healthcare	OR (95% CI): Proportion of IIS use among adolescents (per 10 percent unit increase): 1.09 (1.02-1.17); p= 0.012	Significantly higher compliance rate with increased use of IIS among adolescents which indicates inequality in compliance rate.
Ghas walla, 2022[22]	People aged two	1,208	Vaccine uptake	Person's individual	Age	2-55 years (reference) vs ≥56 years HR: 0.42; 95% CI: 0.18-0.97; P = 0.04	Participants aged 56 years or older were associated with a reduced incidence of receipt of the MenACWY vaccine. There was an

	years or older, with a new diagnosis of HIV who were eligible for MenACWY vaccine			characteristics and behaviours			inequality in vaccine uptake due to age in patients with a new diagnosis of HIV.
			Vaccine uptake	Person's individual characteristics and behaviours	Sex /sexual orientation	Females (reference) vs males HR: 2.72; 95% CI: 1.18-6.26; P = 0.02	Male sex was associated with an increased uptake of the MenACWY vaccine. There was an inequality in vaccine uptake due to sex in patients with a new diagnosis of HIV.
				Person's individual characteristics and behaviours	Immunosuppressive status	Attendance at well-care visit vs no attendance HR: 3.67; 95% CI: 1.11-12.12; P = 0.03	Attendance at a well-care visit was associated with an increased uptake of the MenACWY vaccine. There was an inequality in vaccine uptake based on attendance at a well-care visit in individuals with a new diagnosis of HIV.
			Vaccine uptake	Physical environment	Geographic location/region	South (reference) vs West HR: 2.24; 95% CI: 1.44-3.47; P <0.001	West geographical location was associated with an increased uptake of the MenACWY vaccine. There was an inequality in vaccine uptake based on region of residence in individuals with a new diagnosis of HIV.
						South (reference) vs Midwest HR: 1.78; 95% CI: 1.16-2.71; P = 0.008	Midwest geographical location was associated with an increased uptake of the MenACWY vaccine. There was an inequality in vaccine uptake based on region of residence in individuals with a new diagnosis of HIV.
Ghaswalla, 2021[37]	Patients with newly diagnosed asplenia and eligible for MenACWY or MenB vaccination	MenACWY: 2,273 MenB: 741	Vaccine uptake	Person's individual characteristics and behaviours	Age	HR (95% CI): For MenACWY ≥19 years vs 2-10 years: 0.21 (0.14-0.31); p <0.001 ≥19 years vs 10-18 years: NA For MenB ≥19 years vs 2-10 years: NA ≥19 years vs 10-18 years: 0.34 (0.15-0.79); p=0.013	Age category ≥19 years was statistically significantly associated with less likelihood of receipt of ≥1 dose of MenACWY (vs 2-10 years)/MenB vaccines (vs 10-18 years); which indicates inequality in vaccination by age.
			Vaccine uptake	Physical environment	Geographic location/region	HR (95% CI): For MenB Geographic region Midwest (vs Northeast): 1.63 (1.20-2.22); p=0.002 Midwest (vs South): NA West (vs South): NA For MenB Geographic region Midwest (vs Northeast): NA	Inequality in vaccination by geographic region; Geographic region was significantly associated with likelihood of receipt of ≥1 dose of MenACWY/MenB vaccines. Individuals in Midwest region had significantly higher odds of likelihood of receipt of ≥1 dose of MenACWY compared to Northeast. Similarly, for MenB vaccines, the likelihood of receipt of ≥1 dose was

						Midwest (vs South): 2.53 (1.19-5.41); p=0.016 West (vs South): 2.57 (1.13-5.86); p=0.025	significantly higher in individuals from Midwest and West compared with South.
			Vaccine uptake	Person's individual characteristics and behaviours	Gender identity/sexual orientation	HR (95% CI): For MenACWY Male vs Female: 1.24 (1.05-1.46); p= 0.013 For MenB Male vs Female: Not significant	Inequality in vaccination by sex; Males had significantly higher likelihood of receipt of ≥1 dose of MenACWY vaccine - there was no inequality for MenB.
			Vaccine uptake	Social and economic factors	Education level	HR (95% CI): For MenACWY Less than high school diploma/high school diploma (vs some college or associates degree): 0.78 (0.64-0.94); p=0.011 For MenB Bachelors/graduate degree/professional degree (vs some college or associates degree): 2.24 (1.23-4.09); p= 0.008	Inequity in vaccination by education; There was a significant difference in likelihood of receipt of ≥1 dose of MenACWY/MenB vaccine; As per univariate analysis, individuals with less than high school diploma/high school diploma (vs some college or associates degree) had less likelihood of receipt of ≥1 dose of MenACWY and Bachelors/graduate degree/professional degree (vs some college or associates degree) had higher likelihood of receipt of ≥1 dose of MenB.
			Vaccine uptake	Social and economic factors	Socioeconomic status	HR (95% CI): For MenACWY Household income < $40,000 (vs ≥ $100,000): 0.62 (0.47-0.83); p=0.001	There was a significant difference in likelihood of receipt of ≥1 dose of MenACWY vaccine; As per univariate analysis, individuals with less household income had less likelihood of receipt of ≥1 dose of MenACWY which indicates inequality in vaccination by household income level
			Vaccine uptake	Social and economic factors	Childhood development (Baseline influenza vaccination)	HR (95% CI): For MenACWY: not significant For MenB: 1.94 (1.10-3.43); p=0.023	Baseline influenza vaccination was significantly associated with receipt of MenB. There is inequality in vaccination by baseline influenza vaccination.
			Vaccine uptake	Social and economic factors	Childhood development (Baseline inpatient stay)	HR (95% CI): For MenACWY: 0.79 (0.66-0.95); p=0.014 For MenB: not significant	Baseline inpatient stay was significantly associated with receipt of MenACWY vaccine which indicates inequality in vaccination by baseline inpatient stay.
			Vaccine uptake	Social and economic factors	Childhood development (Baseline office visits)	HR (95% CI): For MenACWY: 1–5 (vs 0): 0.46 (0.30-0.69); p <0.001 6–10 (vs 0): 0.40 (0.26-0.62); p <0.001 11–20 (vs 0): 0.40 (0.26-0.61); p <0.001	Baseline office visits was significantly associated with receipt of MenACWY vaccine. The likelihood of receipt of ≥1 dose of MenACWY decreased with the increase in

						≥21 (vs 0): 0.50 (0.33-0.76); p =0.001 For MenB: 1–5 (vs 0): not significant 6–10 (vs 0): not significant 11–20 (vs 0): not significant ≥21 (vs 0): not significant	office visits. (Inequality in vaccination by baseline office visits)
			Vaccine uptake	Social and economic factors	Childhood development Baseline pharmacy fills)	HR (95% CI): For MenACWY: 14–31 (vs 0–3): not significant ≥32 (vs 0–3): not significant For MenB: 14–31 (vs 0–3): 0.28 (0.13-0.63); p=0.002 ≥32 (vs 0–3): 0.22 (0.09-0.55); p=0.001	Baseline pharmacy fills was significantly associated with receipt of MenB vaccine. The likelihood of receipt of ≥1 dose of MenB decreased with the increase in pharmacy fills. (Inequality in vaccination by baseline pharmacy fills)
			Vaccine uptake	Social and economic factors	Childhood development (Well-care visit)	HR (95% CI): For MenACWY: 6.63 (4.84-9.09); p<0.001 For MenB: 11.17 (3.02-41.26); p<0.001	Attending a well-care visit was significantly associated with likelihood of receipt of ≥1 dose of MenACWY or MenB which inequality in vaccination by well-care visit.
			Vaccine uptake	Social and economic factors	Childhood development (PCV13/PPSV 23)	HR (95% CI): For MenACWY: 26.02 (21.01-32.22); p<0.001 For MenB: 3.89 (2.07-7.29); p<0.001	Inequality in vaccination by baseline vaccination of PCV13/PPSV23; In multivariable Cox regression, the factors most associated with receipt of MenACWY and MenB were receipt of PCV13 or PPSV23 (HR 26.02; 95% CI 21.01–32.22; HR 3.89; 95% CI 2.07–7.29), respectively.
			Vaccine uptake	Social and economic factors	Childhood development (Baseline all-cause healthcare costs)	HR (95% CI): For MenACWY: Baseline all-cause healthcare costs Medical costs- $11,769.05–$54,158.61 (vs $0–$2,260.02): 1.77 (1.42-2.23); p<0.001 Total costs (medical + pharmacy)- $14,774.06–$59,589.77 (vs $0–$3,220.23): 1.59 (1.26-2.00); p<0.001	Inequality in vaccination by Baseline all-cause healthcare costs; In univariable Cox regression analyses, medical costs (HR: 1.77 (1.42–2.23); p<0.001) and total costs (medical + pharmacy) (HR: 1.59 (1.26–2.00); p<0.001) was significantly associated with likelihood of receipt of ≥1 dose of MenACWY. There was no inequity for MenB.
			Vaccine uptake	Social and economic factors	Childhood development (MenB vaccine receipt)	HR (95% CI): For MenACWY: 25.92 (18.54-36.22); p <0.001	Inequality in vaccination by receipt of MenB vaccination at baseline; In univariable Cox regression analyses, baseline receipt of MenB vaccination is significantly associated with likelihood of receipt of ≥1 dose of MenACWY.

			Vaccine uptake	Social and economic factors	Childhood development (MenACWY vaccine receipt)	HR (95% CI): For MenB: 10.74 (5.95-19.39); p<0.001	Inequality in vaccination by receipt of MenACWY vaccination at baseline; In univariable Cox regression analyses, baseline receipt of MenACWY vaccination is significantly associated with likelihood of receipt of ≥1 dose of MenB
Hansen, 2021[38]	General population	7,288	Vaccine uptake	Person's individual characteristics and behaviours	Gender identity/sexual orientation	Unadjusted odds ratio (95% CI): Female: Reference Male: 0.89 (0.68-1.15); p=NR	Sex was not significantly associated with MenB vaccine coverage among adolescents aged 17 years.
			Vaccine uptake	Person's individual characteristics and behaviours	Ethnicity/Race	Unadjusted odds ratio (95% CI): Non-Hispanic White: Reference Hispanic: 1.68 (1.21-2.32) Non-Hispanic Black: 1.22 (0.82-1.83) Other: 1.34 (0.84-2.15); p=NR	Race/ethnicity was significantly associated with MenB vaccine coverage among adolescents aged 17 years, wherein Hispanic adolescents were more likely to have been vaccinated when compared to other ethnic classes which indicates in equality.
			Vaccine uptake	Physical environment	Geographic location/region	Unadjusted odds ratio (95% CI): Northeast: Reference Midwest: 0.8 (0.61, 1.06) South: 0.76 (0.58, 1) West: 0.91 (0.59, 1.43); p=NR	Residing region was not significantly associated with MenB vaccine coverage among adolescents aged 17 years.
			Vaccine uptake	Person's individual characteristics and behaviours	Access to care (≥1 healthcare visit in past 12 months)	Unadjusted odds ratio (95% CI): ≥1 healthcare visit in past 12 months; Yes: 1.35 (0.87-2.08) ≥1 healthcare visit in past 12 months; No: Reference; p=NR	Having a healthcare visit in the past year was significantly associated with MenB vaccine coverage among adolescents aged 17 years. There is inequality in vaccine coverage, where adolescents who had a healthcare visit in the past year had significantly higher MenB vaccine coverage
			Vaccine uptake	Social and economic factors	Insurance status and type	aOR (95% CI): Medicaid/other insurance/uninsured: Reference Private insurance: 0.61 (0.46-0.79); p=NR	Insurance type as not significantly associated with MenB vaccine coverage among adolescents aged 17 years based on a multivariate analysis.
			Vaccine uptake	Person's individual characteristics and behaviours	Chronic health conditions	Unadjusted odds ratio (95% CI): Yes: 1.40 No: 1.00 (Ref); p=NR	Presence of chronic conditions was not significantly associated with vaccine uptake
			Vaccine uptake	Person's individual characteristics and behaviours	Access to care (HPV vaccination)	aOR (95% CI): HPV vaccination Yes: 1.74 (1.29-2.35) No: 1.0 (Ref); p=NR	There is an inequality where MenB vaccination is significantly associated with receipt of other vaccines recommended for use in adolescents.

			Vaccine uptake	Person's individual characteristics and behaviours	Access to care (MenACWY vaccine doses)	aOR (95% CI): MenACWY Doses 0-1: 1.0 (Ref) 2: 5.81 (4.14-8.13); p=NR	MenB vaccine receipt remained significantly associated with receipt of 2 MenACWY vaccine doses compared to 0-1 doses. There is an inequality where MenB vaccination is associated with receipt of other vaccines recommended for use in adolescents.
			Vaccine uptake	Person's individual characteristics and behaviours	Access to care (up-to-date Tdap vaccination status)	Unadjusted odds ratio (95% CI): Tdap vaccination: Yes: 1.90 (1.01-3.56) No: 1.0 (Ref); p=NR	MenB vaccine receipt remained significantly associated with up-to-date Tdap vaccination status. There is an inequality where MenB vaccination is associated with receipt of other vaccines recommended for use in adolescents
Hollo way, 2018[24]	Men who have sex with men (MSM) aged 18 years or older, who might or might not have received the MenACWY vaccine	350	Vaccine uptake	Person's individual characteristics and behaviours	Age	Age group 18-29 (reference) vs age group ≥30 Adjusted OR: 2.57; 95% CI: 1.31-5.03; P = 0.006	Individuals in the higher age group of ≥30 group were significantly associated with greater MenACWY vaccine uptake compared to the younger age group of 18-29 years. There was an inequality in vaccine uptake due to age in MSM.
			Vaccine uptake	Person's individual characteristics and behaviours	Ethnicity/Race	Non-Hispanic White (reference) vs Non-Hispanic Black/African American Adjusted OR: 1.3; 95% CI: 0.51-3.36; P = 0.42 Non-Hispanic White (reference) vs Hispanic Adjusted OR: 1.53; 95% CI: 0.69-3.38; P = 0.11 Non-Hispanic White (reference) vs other Adjusted OR: 0.51; 95% CI: 0.18-1.45; P = 0.06	No association was observed between vaccine uptake and ethnicity/race.
			Vaccine uptake	Person's individual characteristics and behaviours	Illegal drug use	No illicit drug use (reference) vs illicit drug use Adjusted OR: 1.21; 95% CI: 0.65-2.24; P = 0.56	No association was observed between vaccine uptake and illicit drug use.
			Vaccine uptake	Person's individual characteristics and behaviours	Sex /sexual orientation	No. of sexual partners in previous 6 months, 0-5 (reference) vs no. of sexual partners in previous 6 months, 6-10 Adjusted OR: 0.57; 95% CI: 0.24-1.38; P = 0.33	No association was observed between vaccine uptake and the number of men with whom the MSM had sex (sexual partners) in previous 6 months.
			Vaccine uptake	Person's individual characteristics and behaviours	Sex /sexual orientation	No. of sexual partners in previous 6 months, 0-5 (reference) vs no. of sexual partners in previous 6 months, ≥11 Adjusted OR: 0.8; 95% CI: 0.32-2.01; P = 0.91	
			Vaccine uptake	Person's individual	Immunosuppressive status	HIV status, negative (reference) vs HIV status, Positive	No association was observed between vaccine uptake and HIV status.

				characteristics and behaviours		Adjusted OR: 1.12; 95% CI: 0.43-2.91; P = 0.81	
			Vaccine uptake	Social and economic factors	Education level	≤High school diploma (reference) vs ≥some college Adjusted OR: 0.91; 95% CI: 0.48-1.74; P = 0.77	No association was observed between vaccine uptake and education level.
			Vaccine uptake	Social and economic factors	Wealth	Annual household income, <$20,000 (reference) vs ≥ annual household income, ≥$20,000 Adjusted OR: 0.77; 95% CI: 0.33-1.8; P = 0.54	No association was observed between vaccine uptake and annual household income ($).
			Vaccine uptake	Social and economic factors	Wealth	Resides in Hollywood or West Hollywood (reference) vs does not reside in Hollywood or West Hollywood Adjusted OR: 1.29; 95% CI: 0.67-2.49; P = 0.44	No association was observed between vaccine uptake and residing region.
				Social and economic factors	Wealth	Resides in a ZIP code where ≥20% of all families were living below the federal poverty level (reference) vs does not reside in a ZIP code where ≥20% of all families were living below the federal poverty level Adjusted OR: 0.97; 95% CI: 0.48-1.93; P = 0.93	No association was observed between vaccine uptake and residing region.
Huang, 2020[34]	Individuals who received or did not receive meningococcal MenB vaccine within the previous 6 months	1,521	Vaccine uptake	Person's individual characteristics and behaviours	Sex /sexual orientation	Males (reference) vs females OR: 0.840; 95% CI: NR; P = 0.051	Females were less likely to be vaccinated than males. However, the difference did not quite reach statistical difference.
			Vaccine uptake	Person's individual characteristics and behaviours	Ethnicity/Race	Non-Hispanic White (reference) vs non-Hispanic Black OR: 0.755; 95% CI: NR; P = 0.026	Non-Hispanic Black were significantly less likely to be vaccinated when compared with non-Hispanic White. There was an inequality in vaccine uptake due to race/ethnicity.
			Vaccine uptake			Non-Hispanic White (reference) vs Hispanic OR: 0.694; 95% CI: NR; P = 0.006	Hispanic were significantly less likely to be vaccinated when compared with non-Hispanic White. There was an inequality in vaccine uptake due to race/ethnicity.
			Vaccine uptake			Non-Hispanic White (reference) vs Asian OR: 0.775; 95% CI: NR; P = 0.112	There was not significant difference in vaccinate uptake in Asians compared with Non-Hispanic White.
			Vaccine uptake			Non-Hispanic White (reference) vs Other/don't know/NA OR: 0.788; 95% CI: NR; P = 0.173	There was not significant difference in vaccine uptake in Other/Unknown races/ethnicities compared with Non-Hispanic White.
			Vaccine uptake	Physical environment	Housing and household size	Parents/alone/other/don't know (reference) vs on-campus dormitory/sharing with others OR: 2.094; 95% CI: NR; P <0.0001	Participants living in on-campus dormitory/shared living were significantly more likely to be vaccinated than living with parents/alone/other/don't know category.

							There was an inequality in vaccine uptake due to housing and household size.
			Vaccine uptake	Social and economic factors	Insurance status and type	69.4% private/commercially insured, 7.3% in student healthcare plan, 18% in Medicaid, 2.4% in government/ Veterans Affairs hospital, 1.4% not insured, 0.3% in other insurances and 1.1% did not know of the insurance scheme/type	Proportion of individuals covered under private/commercial insurance had reported to have more vaccine coverage. There was an inequality in vaccine uptake due to insurance status/type.
Kempe, 2018[52]	Paediatricians and family physicians	660	Vaccine recommendation	Person's individual characteristics and behaviours	Age	Proportion n (%) Paediatricians - Strongly recommend Healthy 11-12 years old: 4 Healthy 16-18 years old: 34 Healthy adolescents/young adults entering college: 44 - Recommend, but not strongly Healthy 11-12 years old: 7 Healthy 16-18 years old: 24 Healthy adolescents/young adults entering college: 22 - Makes no recommendation Healthy 11-12 years old: 81 Healthy 16-18 years old: 37 Healthy adolescents/young adults entering college: 31 - Recommend against Healthy 11-12 years old: 8 Healthy 16-18 years old: 5 Healthy adolescents/young adults entering college: 4 Family physicians - Strongly recommend Healthy 11-12 years old: 18 Healthy 16-18 years old: 29 Healthy adolescents/young adults entering college: 38 - Recommend, but not strongly Healthy 11-12 years old: 15 Healthy 16-18 years old: 21 Healthy adolescents/young adults entering college: 18	Numerically higher number of paediatricians and family physicians strongly recommended MenB vaccination in cohort of healthy 16-18 years old and healthy adolescents/young adults entering college than healthy 11-12 years old. (Significance- unknown). Except for 11-12 year olds, paediatricians have a higher rate of strongly recommending vaccination than FPS.

						- Makes no recommendation Healthy 11-12 years old: 63 Healthy 16-18 years old: 47 Healthy adolescents/young adults entering college: 42 - Recommend against Healthy 11-12 years old: 4 Healthy 16-18 years old: 3 Healthy adolescents/young adults entering college: 2	
		660	Vaccine recommendation	Person's individual characteristics and behaviours	Immunosuppressive status	Proportion n (%) Paediatricians - Strongly recommend to ≥10 year olds with an increased risk for meningococcal disease: 65 - Recommend, but not strongly to ≥10 year olds with an increased risk for meningococcal disease: 16 - Makes no recommendation to ≥10 year olds with an increased risk for meningococcal disease: 18 - Recommend against to ≥10 year olds with an increased risk for meningococcal disease: 1 Family physicians - Strongly recommend to ≥10 year olds with an increased risk for meningococcal disease: 41 - Recommend, but not strongly to ≥10 year olds with an increased risk for meningococcal disease: 16 - Makes no recommendation to ≥10 year olds with an increased risk for meningococcal disease: 43 - Recommend against to ≥10 year olds with an increased risk for meningococcal disease: 0	Numerically higher number of paediatricians and family physicians strongly recommended MenB vaccination in cohort of ≥10 year olds with an increased risk for meningococcal disease than healthy 11-12 years old. (Significance- unknown). Paediatricians have a higher rate of strongly recommending vaccination than FPs.
Kurosky, 2019[33]	Younger adolescents aged 10.5 through 13 years and older adolescents aged	Commercial Claims and Encounters Younger adolescents:	Vaccine uptake	Person's individual characteristics and behaviours	Age	For Commercial Claims and Encounters Adjusted odds ratio (95% CI): Younger adolescents: Reference Older adolescents: 0.68 (0.67-0.69); p<0.001	In Commercial Claims and Encounters cohort, older adolescents were significantly associated with a decreased likelihood of receiving MenACWY (negative association). This indicates inequality where older adolescents have a decreased likelihood of receiving MenACWY.
			Vaccine uptake	Person's individual characteristics and behaviours	Gender identity/sexual orientation	For Commercial Claims and Encounters Adjusted odds ratio (95% CI): Male: Reference Female: 1.00 (0.99-1.01); p=NR	In Commercial Claims and Encounters cohort, sex was not significantly associated with MenACWY vaccination uptake.

	15.5 years through 18 years	376,825 Older adolescents: 419,814 Medicaid: Younger adolescents: 310,383 Older adolescents: 206,301	Vaccine uptake	Physical environment	Geographic location/region	For Commercial Claims and Encounters Adjusted odds ratio (95% CI): Northeast: Reference North Central: 1.76 (1.73-1.79) South: 1.79 (1.76-1.82) West: 1.35 (1.32-1.37) Missing/Unknown: 1.53 (1.3-1.8)	In Commercial Claims and Encounters cohort, region other than Northeast was significantly associated with increased likelihood of receiving MenACWY vaccine in younger compared to older adolescents which indicates inequalities in vaccine uptake between young and older adolescents by region.
			Vaccine uptake	Physical environment		For Commercial Claims and Encounters Adjusted odds ratio (95% CI): Urban: Ref Rural: 0.72 Unknown: 0.93	In Commercial Claims and Encounters cohort, MenACWY uptake was significantly higher in the urban setting than rural setting which indicates inequalities in vaccine uptake as per rurality.
			Vaccine uptake	Person's individual characteristics and behaviours	Age	For Medicaid Adjusted odds ratio (95% CI): Younger adolescents: Reference Older adolescents: 0.64 (0.63-0.64); p=NR	In Medicaid cohort, older adolescents were significantly associated with a decreased likelihood of receiving MenACWY which indicates inequalities in vaccine uptake as per age.
			Vaccine uptake	Person's individual characteristics and behaviours	Gender identity/sexual orientation	For Medicaid Adjusted odds ratio (95% CI): Male: Reference Female: 1.03 (1.02-1.05); p=NR	In Medicaid cohort, sex was not significantly associated with MenACWY vaccination uptake
			Vaccine uptake	Person's individual characteristics and behaviours	Ethnicity/Race	For Medicaid Adjusted odds ratio (95% CI): White: Reference Black: 1.33 (1.31-1.35); p=NR Other known: 1.06 (1.03-1.08); p=NR Unknown: 1.27 (1.17-1.39); p=NR Missing: 1.33 (1.29-1.36); p=NR	There is an inequality where all non-whites have a higher likelihood of receiving MenACWY vaccination compared to whites.
			Vaccine uptake	Physical environment	Geographic location/region	For Medicaid Adjusted odds ratio (95% CI): Urban: Ref Rural: 0.78 (0.77-0.80); p=NR Unknown: 0.60 (0.44-0.83); p=NR	In Medicaid cohort, no association between vaccine uptake by residential area between the young and older adolescents.
			Vaccine uptake	Person's individual characteristics and behaviours	Access to care (Number of preventive care/well-child	For Commercial Claims and Encounters Adjusted odds ratio (95% CI): Number of preventive care/well-child visits (per individual): 1.63 (1.62-1.64); p<0.001	In Commercial Claims and Encounters cohort, number of preventive care/well-child visit was significantly associated with an increased likelihood for receiving MenACWY. There is an inequality where the greater the number of

					visits per individual)		preventive care/well-child visit was associated with an increased likelihood for receiving MenACWY
			Vaccine uptake	Person's individual characteristics and behaviours	Access to care (Number of outpatient office visits)	For Commercial Claims and Encounters Adjusted odds ratio (95% CI): 1 (1.00-1.00); p=NR	In Commercial Claims and Encounters cohort, mean number of outpatient office visits were not associated with vaccine uptake,
			Vaccine uptake	Person's individual characteristics and behaviours	Access to care (Total number of non-MenACWY vaccines received)	For Commercial Claims and Encounters Adjusted odds ratio (95% CI): 1.38 (1.37-1.38); p<0.001	In Commercial Claims and Encounters cohort, number of non-MenACWY vaccines was significantly associated with an increased likelihood for receiving MenACWY vaccine which indicates inequality.
			Vaccine uptake	Person's individual characteristics and behaviours	Access to care (Healthcare costs)	For Commercial Claims and Encounters Adjusted odds ratio (95% CI): 1 (1.00-1.00); p=NR	In Commercial Claims and Encounters cohort, mean healthcare costs were not associated with vaccine uptake.
			Vaccine uptake	Person's individual characteristics and behaviours	Access to care (Number of preventive care/well-child visits per individual)	For Medicaid Adjusted odds ratio (95% CI): 1.42 (1.42-1.43); p=NR	In Medicaid cohort, number of preventive care/well-child visit was associated with an increased likelihood for receiving MenACWY. There is an inequality where the greater the number of preventive care/well-child visit was associated with an increased likelihood for receiving MenACWY
			Vaccine uptake	Person's individual characteristics and behaviours	Access to care (Number of outpatient office visits)	For Medicaid Adjusted odds ratio (95% CI): 1 (1.0-1.0); p=NR	In Medicaid cohort, mean number of outpatient office visits were not associated with vaccine uptake.
			Vaccine uptake	Person's individual characteristics and behaviours	Access to care (Total number of non-MenACWY vaccines received)	For Medicaid Adjusted odds ratio (95% CI): 1.56 (1.56-1.57); p=NR	In Medicaid cohort, mean number of outpatient office visits were numerically higher in older adolescents when compared to younger ones which indicates inequality.
			Vaccine uptake	Person's individual characteristics and behaviours	Access to care (Healthcare costs)	For Medicaid Adjusted odds ratio (95% CI): 1 (1.00-1.00); p=NR	In Medicaid cohort, mean healthcare costs were not associated with vaccine uptake.

			Vaccine uptake	Social and economic factors	Insurance status and type	Adjusted odds ratio (95% CI): For Commercial Claims and Encounters Younger adolescents: Comprehensive: 0.85 (0.81-0.88) Exclusive provider organisation: 1.12 (1.07-1.17) Health maintenance organisation: Ref Point of service: 0.87 (0.85-0.89) Preferred provider organisation: 1.02 (1.00-1.04) Point of service with capitation: 1.00 (0.90-1.12) Consumer-directed health plan: 1.21 (1.18-1.24) High deductible health plan: 1.07 (1.04-1.11) Missing: 1.20 (1.15-1.25); p=NR	In Commercial Claims and Encounters cohort, compared to HMO (ref) all health plans except Comprehensive and Point of Service were associated with an increased likelihood of receiving MenACWY vaccine. There is inequality in likelihood of receiving MenACWY vaccine depending on type of health plan.
			Vaccine uptake	Person's individual characteristics and behaviours	Access to care (Attributed Provider Type)	Adjusted odds ratio (95% CI): Family medicine provider: 0.41 (0.41-0.42) Paediatrician: Ref Internal medicine provider: 0.39 (0.38-0.41) Obstetrician/gynaecologist: 0.22 (0.20-0.24) Other provider type: 0.62 (0.61-0.63) No consistent provider: 0.55 (0.55-0.56) p<0.001	Attributed provider types other than paediatrician (ref) were significantly associated with a decreased likelihood of receiving MenACWY which indicates inequality in likelihood of receiving MenACWY vaccine.
La, 2021[10]	Adolescents aged 17 years	7288	Vaccine uptake	Physical environment	Geographic location/region	Proportion (%): ≥1 dose: Northeast: 18.3 Midwest: 15.3 South: 14.6 West: 17 ≥2 doses: Northeast: 9.3 Midwest: 7.3 South: 6.3 West: 7.8; p=NR	Among Census regions, numerically, the lowest MenB vaccine coverage was in the South and the highest in the Northeast. There is an inequality in coverage across regions where the lowest MenB vaccine coverage was in the South and the highest in the Northeast (census regions)
			Vaccine uptake	Person's individual characteristics and behaviours	Gender identity/sexual orientation	Proportion (%): ≥1 dose: Male: 15.1 Female: 16.8; p=NR	Numerically, higher vaccination coverage rate was observed for females when compared to males. There is an inequality by sex, where females have a greater coverage than males based on proportions. But there is no significant association in the multivariate analysis

			Vaccine uptake	Person's individual characteristics and behaviours	Ethnicity/Race	Proportion (%): ≥1 dose: Hispanic: 20.8 Non-Hispanic White only: 13.5 Non-Hispanic Black only: 16.1 Non-Hispanic other/multiple races: 17.4; p=NR	There is an inequality by race/ethnicity where numerically higher vaccination coverage rates observed among adolescents of Hispanic ethnicity when compared to other races/ethnic classes. This was not statistically significant in the multivariate analysis
			Vaccine uptake	Social and economic factors	Wealth	Proportion (%): ≥1 dose: Total combined family income, ≤$25,000: 19.7 Total combined family income, $25,001 to $50,000: 15.3 Total combined family income, $50,001 to $75,000: 13 Total combined family income, ≥$75,001: 14.9 Total combined family income, Don't know/refused: 19; p=NR	Numerically, higher vaccination coverage rate was observed for adolescents from lower income when compared to higher income categories.
			Vaccine uptake	Social and economic factors	Social deprivation	Proportion (%): ≥1 dose: Family's poverty status, above poverty >$75,000: 14.9 Family's poverty status, above poverty ≤$75,000: 14.1 Family's poverty status, below poverty: 19.6 Family's poverty status, unknown Total combined family income, Don't know/refused: 21.7; p=NR	Irrespective of the group for which poverty level was unknown, numerically, higher vaccination coverage rate was observed for adolescents with a "below poverty" family poverty status.
			Vaccine uptake	Social and economic factors	Education level of parents in the case of minors	Proportion (%): ≥1 dose: Mother's educational attainment, <12 years: 22 Mother's educational attainment, 12 years: 16.5 Mother's educational attainment, >12 years; non-college graduate: 14.1 Mother's educational attainment, college graduate: 14.9; p=NR	Numerically, higher vaccination coverage rate was observed for adolescents from lower maternal education level families.
			Vaccine uptake	Social and economic factors	Insurance status and type	Proportion (%): ≥1 dose: Current health insurance status, private only: 13.3 Current health insurance status, any Medicaid: 21.9 Current health insurance status, other: 12.5	Numerically, lower vaccination coverage rate was observed among uninsured adolescents; There is an inequality in vaccination coverage by insurance status where a lower vaccination coverage rate was observed among uninsured adolescents.

						Current health insurance status, uninsured: 10.8; p=NR	
			Vaccine uptake	Social and economic factors	Insurance status and type	Proportion (%): ≥1 dose: Never uninsured since age 11 years: 16.2 Uninsured at some point since age 11 years: 14.3; p=NR	Numerically, lower vaccination coverage rate was observed among adolescents who got uninsured at some point since age 11 years; There is an inequality in continuity of health insurance coverage where a lower vaccination coverage rate was observed among adolescents who got uninsured at some point since age 11 years.
			Vaccine uptake	Person's individual characteristics and behaviours	Access to care (Aged 16 or 17 years at last check-up)	Proportion (%): ≥1 dose: Yes: 16.8 No: 6.9; p=NR	Lower vaccination coverage rate was observed among those who had not had a check-up at the age of 16 or 17 years. There is an inequality in vaccination coverage by age of last check-up where a lower vaccination coverage was observed for adolescents who did not have a check-up aged 16 or 17 (This is no longer the case in the multivariate analysis)
			Vaccine uptake	Person's individual characteristics and behaviours	Access to care (Number of physician or other healthcare professional visits in past 12 months)	Proportion (%): ≥1 dose: Number of physician or other healthcare professional visits in past 12 months; None: 12.7 1: 15.9 2-3: 16.1 4-5: 18 6-7: 13.4 ≥8: 18.5 Don't know/refused: 22.3; p=NR	Numerically, lower vaccination coverage rate was observed among those who had not visited a physician or other healthcare professional in the past 12 months. There is an inequality in vaccine coverage by continuity of care where a lower vaccination coverage rate was observed among those who had not visited a physician or other healthcare professional in the past 12 months.
			Vaccine uptake	Physical environment	Geographic location/region	Proportion (%): ≥1 dose: Pacific: 17.4 Mountain: 16.2 West North Central: 14.7 West South Central: 13 East North Central: 15.5 East South Central: 8.8 Middle Atlantic: 19.7 South Atlantic: 17.6	Numerically, the lowest MenB vaccine coverage was noticed in the East South Central division and the highest estimates in the Middle Atlantic division. There is an inequality in coverage across regions where the lowest MenB vaccine coverage was noticed in the East South Central division and the highest estimates in the Middle Atlantic division.

						New England: 14.1 ≥2 doses, % (95% CI): Pacific: 8.19 Mountain: 7 West North Central: 7.63 West South Central: 4.95 East North Central: 7.11 East South Central: 2.95 Middle Atlantic: 9.85 South Atlantic: 8.33 New England: 7.72; p=NR	
			Vaccine uptake	Person's individual characteristics and behaviours	Gender identity/sexual orientation	OR (95% CI): Male: Reference Female: 1.00 (0.76-1.32); p= 0.9879	Sex was not significantly associated with MenB vaccine coverage among adolescents aged 17 years
			Vaccine uptake	Person's individual characteristics and behaviours	Ethnicity/Race	OR (95% CI): Non-Hispanic White only: Reference Non-Hispanic Black only: 0.74 (0.48-1.14); p= 0.1784 Non-Hispanic other/multiple races: 1.14 (0.71-1.82); p= 0.5912 Hispanic: 1.31 (0.92-1.86); p= 0.1355	Race/ethnicity was not significantly associated with MenB vaccine coverage among adolescents aged 17 years.
			Vaccine uptake	Social and economic factors	Insurance status and type	Private insurance: Reference Any Medicaid insurance: 1.77 (1.32-2.39); p=0.0002 Other insurance: 1.04 (0.67-1.62); p=0.8469 Uninsured: 0.98 (0.56-1.72); p=0.9391	Having a Medicaid insurance was significantly associated with increased vaccination coverage of ≥1 dose of MenB vaccine as compared to those having a private insurance. There is inequality in having the adolescents already been vaccinated based on insurance, where adolescents having a Medicaid insurance were observed to have increased vaccine coverage.
			Vaccine uptake	Person's individual characteristics and behaviours	Access to care (Aged 16 or 17 years at last check-up)	OR (95% CI): Aged 16 or 17 years at last check-up Yes: 1.72 (0.97-3.04); p=0.0645 No: Reference	Age 16 or 17 at last check-up was not significantly associated with coverage
			Vaccine uptake	Person's individual characteristics and behaviours	Previous vaccination status (Up-to-	OR (95% CI): Up-to-date with HPV vaccination Yes: 1.94 (1.41-2.67); p<0.0001 No: Reference	Being up-to-date with other routinely administered vaccines significantly increased the likelihood of receiving MenB vaccination which indicated inequality.

					date with HPV vaccination)		
			Vaccine uptake	Person's individual characteristics and behaviours	Previous vaccination status (Up-to-date with MenACWY vaccination)	OR (95% CI): Up-to-date with MenACWY vaccination Yes: 4.03 (2.92-5.56); p <0.0001 No: Reference	Being up-to-date with other routinely administered vaccines significantly increased the likelihood of receiving MenB vaccination. There is inequality in vaccine coverage, wherein adolescents who were up-to-date with other routinely administered vaccines had an increased likelihood of receiving MenB vaccination.
			Vaccine uptake	Person's individual characteristics and behaviours	Previous vaccination status (MenACWY vaccination status at age 11-15 years)	Proportion (%): Vaccinated with ≥1 dose of MenACWY at age 11-15 years: 17.2 Not vaccinated with ≥1 dose of MenACWY at age 11-15 years: 10.9; p=NR	MenB vaccination coverage for ≥1 dose was higher among adolescents vaccinated with ≥1 dose of MenACWY at age 11-15 years compared to those not vaccinated. There is inequality in vaccine coverage, wherein MenB vaccination coverage for ≥1 dose was noticed to be higher among adolescents vaccinated with ≥1 dose of MenACWY at age 11-15 years compared to those not vaccinated
			Vaccine uptake	Person's individual characteristics and behaviours	Previous vaccination status	Proportion (%): Vaccinated with ≥1 dose of MenACWY at age 16-17 years: 25.4 Not vaccinated with ≥1 dose of MenACWY at age 16-17 years: 4.7; p=NR	MenB vaccination coverage for ≥1 dose was higher among adolescents vaccinated with ≥1 dose of MenACWY at age 16-17 years compared to those not vaccinated. There is inequality in vaccine coverage, wherein MenB vaccination coverage for ≥1 dose was higher among adolescents vaccinated with ≥1 dose of MenACWY at age 16-17 years compared to those not vaccinated.
			Vaccine uptake	Physical environment	Geographic location/region	OR (95% CI): New England: Reference Middle Atlantic: 1.46 (0.95-2.23); p=0.0817 East North Central: 1.36 (0.9-2.04); p=0.1437 West North Central: 1.48 (0.97-2.24); p=0.0687 South Atlantic: 1.9 (1.24-2.92); p=0.0033 East South Central: 1 (0.57-1.76); p=0.9927 West South Central: 1.16 (0.75-1.79); p=0.5097 Mountain: 1.64 (1.03-2.62); p=0.0364 Pacific: 1.26 (0.65-2.42); p=0.4935	Adolescents residing in the South Atlantic or the Mountain census divisions were significantly more likely to have received ≥1 dose of the MenB vaccine than those residing in New England. There is inequity in having the adolescents already been vaccinated based on the census division of residence, where adolescents residing in the South Atlantic or the Mountain census divisions were noticed to have increased vaccine uptake than those residing in New England.

Marshall, 2022[57]	Patients with complement component deficiencies (CDs) and eligible for MenACWY or MenB vaccination	MenACWY: 1,470 MenB: 396	Vaccine uptake	Person's individual characteristics and behaviours	Age	Proportion n/N (%): For MenACWY Age groups 2-10 years: 12/106 (11.3) 11-18 years: 35/118 (29.7) 19-55 years: 14/902 (1.6) ≥55 years: 4/344 (1.2) For MenB 10-18 years: 6/46 (13) ≥19 years: 0/350 (0)	Numerically there was inequality in vaccination by age; Vaccination was much more likely among children and adolescents than adults (12/106 [11.3%] among those 2–10 years of age; 35/118 [29.7%] among those 11–18 years; 14/902 [1.6%] among those 19–55 years; and 4/344 [1.2%] among those ≥56 years). The only recipients of MenB vaccination were children and adolescents (6/46 [13.0%] among those 10–18 years of age; 0/350 [0.0%] among those ≥19 years).
Packnett, 2022[35]	Adolescents and young adults with private (Commercial) and Medicaid insurance who initiated MenB vaccination	Commercial: 156,080 Medicaid: 57,082	Series completion	Person's individual characteristics and behaviours	Gender identity/sexual orientation	Adjusted relative risks (aRRs) (95% CI): For Commercial Female vs Male: 1.02 (1.02-1.03); p<0.001 For Medicaid Female vs Male: 1.05 (1.03-1.06); p<0.001	Inequality in vaccination by sex; There was significant difference in completion of a MenB series in both populations across sex; female had significantly higher rates of series completion than males.
			Series completion	Person's individual characteristics and behaviours	Age	Adjusted relative risks (aRRs) (95% CI): For Commercial Age (vs 16 years) 17 years: 0.86 (0.85-0.87); p <0.001 18 years: 0.71 (0.70-0.72); p <0.001 19 years: 0.61 (0.60-0.63); p <0.001 20 years: 0.58 (0.56-0.60); p <0.001 21 years: 0.55 (0.53-0.57); p <0.001 22 years: 0.55 (0.52-0.58); p <0.001 23 years: 0.57 (0.52-0.62); p <0.001 For Medicaid Age (vs 16 years) 17 years: 0.74 (0.73-0.76); p <0.001 18 years: 0.50 (0.48-0.52); p <0.001 19 years: 0.55 (0.49-0.62); p <0.001 20 years: 0.60 (0.51-0.70); p <0.001	There was significant difference in completion of a MenB series in both populations as per age; increasing age had significantly lower rates of series completion. (Inequality in vaccination by age)

						21 years: 0.59 (0.49-0.72); p <0.001 22 years: 0.57 (0.45-0.72); p <0.001 23 years: 0.43 (0.32-0.57); p <0.001	
			Series completion	Physical environment	Geographic location/region	Adjusted relative risks (aRRs) (95% CI): For Commercial (not reported for Medicaid) Region (vs New England) Mid-Atlantic: 0.95 (0.93-0.96); p<0.001 Pacific: 0.90 (0.88-0.92); p<0.001 East North Central: 0.86 (0.84-0.88); p<0.001 West North Central: 0.83 (0.81-0.85); p<0.001 South Atlantic: 0.79 (0.78-0.81); p<0.001 East South Central: 0.79 (0.77-0.81); p<0.001 West South Central: 0.76 (0.74-0.78); p<0.001 Mountain: 0.75 (0.73-0.78); p<0.001 Unknown: 0.75 (0.71-0.80); p<0.001	There was significant difference in completion of a MenB series as per geography; receipt of first dose outside New England had significantly less rates of series completion. (Inequality in vaccination by geography)
			Series completion	Physical environment	Geographic location/region	Adjusted relative risks (aRRs) (95% CI): For Commercial Region Rural vs Urban/unknown: 0.96 (0.94-0.98); p<0.001 For Medicaid Region Rural vs Urban/unknown: 0.96 (0.94-0.99); p=0.002	There was significant difference in completion of a MenB series as per geography; rural population had significantly lesser rates of series completion than urban populations (Inequality in vaccination by geography).
			Series completion	Person's individual characteristics and behaviours	Ethnicity/Race	Adjusted relative risks (aRRs) (95% CI): For Medicaid (Not reported for Commercial) Race Hispanic vs White: 1.01 (0.98-1.05); p=0.44 Black vs White: 0.86 (0.84-0.88); p<0.001 Other vs White: 1.05 (1.01-1.09); p=0.007 Unknown vs White: 1.08 (1.04-1.12); p<0.001	Inequality in vaccination by race; There was significant difference in completion of a MenB series in Medicaid-insured population as per race wherein population with Black race had significantly reduced completion rate while it was significantly greater in unknown or other race cohort vs White. Data were not reported for commercially insured population.
			Series completion	Social and economic factors	Insurance status and type	Proportion (%) Commercial: 56.7 Medicaid: 44.7	Inequality in vaccination by insurance type; There was a numeric difference in MenB series completion rate as per insurance type; it was higher in commercially insured population than Medicaid.
			Series completion	Person's individual characteristics and behaviours	Access to care (Provider (vs paediatrician))	Adjusted relative risks (aRRs) (95% CI): Provider (vs paediatrician) For Commercial Family medicine: 0.88 (0.87-0.89); p<0.001	Inequality in vaccination by vaccine provider; paediatricians had significantly higher completion rates than most other providers, although pharmacists had the highest

						Internal medicine: 0.95 (0.92-0.97); p<0.001 Pharmacy: 1.09 (1.05-1.14); p<0.001 Obstetrician/gynaecologist: 0.89 (0.77-1.03); p<0.001 Other: 0.91 (0.89-0.92); p<0.001 Unknown: 0.91 (0.89-0.93); p<0.001 For Medicaid Family medicine: 0.91 (0.87-0.96); p<0.001 Internal medicine: 0.97 (0.86-1.08); p=0.55 Pharmacy: 0.43 (0.30-0.61); p<0.001 Obstetrician/gynaecologist: 0.99 (0.84-1.17); p=0.89 Other: 1.00 (0.98-1.02); p=0.93 Unknown: 0.93 (0.91-0.95); p<0.001	completion rate in the Commercial population, but the lowest rate in the Medicaid population.
			Series completion	Person's individual characteristics and behaviours	Access to care (Co-administered with index MenB dose (vs none))	Adjusted relative risks (aRRs) (95% CI): For Commercial MenACWY vaccine: 0.92 (0.91-0.93); p <0.001 Influenza vaccine: 1.02 (1.01-1.04); p=0.005 Other vaccine: 0.89 (0.88-0.90); p <0.001 For Medicaid MenACWY vaccine: 1.03 (1.01-1.05); p=0.005 Influenza vaccine: 1.04 (1.01-1.08); p=0.006 Other vaccine: 0.82 (0.81-0.84); p<0.001	Co-administration of MenACWY/other vaccines were significantly associated with reduced rates of series completion in both Commercial and Medicaid population (Inequality in vaccination by co-administration of vaccines).
			Series completion	Person's individual characteristics and behaviours	Access to care (Pre-index vaccine admin visits)	Adjusted relative risks (aRRs) (95% CI): For Commercial: 1.09 (1.07-1.10); p <0.001 For Medicaid: 1.14 (1.11-1.17); p <0.001	Inequality in vaccination by pre-index vaccine admin visits; Increase in pre-index vaccine admin visits by 1 visit significantly increased the series completion of MenB vaccine in Commercial and Medicaid population.
			Series completion	Person's individual characteristics and behaviours	Access to care (Pre-index preventive/well-child visits (per increase of 1 visit))	Adjusted relative risks (aRRs) (95% CI): For Commercial: 1.01 (0.99-1.02); p=0.33 For Medicaid: 0.98 (0.97-0.99); p<0.001	Inequality in vaccination by pre-index preventive/well-child visits; No impact of increase in pre-index preventive/well-child visits on MenB vaccine series completion rate in Commercial population, however, it significantly reduced completion rate in Medicaid populations.
			Series completion	Person's individual characteristics and behaviours	Immunosuppressive status (Pre-index HIV (vs no))	Adjusted relative risks (aRRs) (95% CI): For Commercial: 1.24 (1.05-1.47); p=0.010 For Medicaid: 1.16 (0.78-1.73); p=0.47	Pre-index HIV was not significantly associated with MenB vaccine series completion rate in Commercial and Medicaid population.

			Series completion	Social and economic factors	Access to care (Pre-index expenditure Per $1 per person per month increase)	Adjusted relative risks (aRRs) (95% CI): For Commercial: 1.00 (1.00-1.00); p=0.15 For Medicaid: 1.00 (1.00-1.00); p=0.18	Pre-index expenditure (Per $1 per person per month increase) was not significantly associated with MenB vaccine series completion rate in Commercial and Medicaid population.
Pingali, 2021[39]	Adolescents aged 13-17 years	NR	Vaccine uptake	Person's individual characteristics and behaviours	Age	Proportion (%): ≥1 dose of MenACWY or meningococcal-unknown type vaccine: Age at interview: 13 years: 87.5 14 years: 87.6 15 years: 90.4 16 years: 89.1 17 years: 92.3 ≥2 doses of MenACWY or meningococcal-unknown type vaccine: Age at interview: 13 years: NA 14 years: NA 15 years: NA 16 years: NA 17 years: 54.4 p<0.05	Statistically significant difference (p<0.05) by age was noticed in estimated vaccination coverage, wherein the adolescents aged 15 and 17 years were observed to have increased vaccination coverage. There is inequality due to age in receiving the MenACWY or meningococcal-unknown type vaccine, where in adolescents aged 15 and 17 years were observed to have increased vaccination coverage.
			Vaccine uptake	Physical environment	Geographic location/region	Proportion (%): ≥1 dose of MenACWY or meningococcal-unknown type vaccine: Metropolitan statistical area: Non-metropolitan statistical area: 85.7 Metropolitan statistical area non-principal city: 89.4 Metropolitan statistical area principal city: 90.2 p<0.05	There is inequality based on the MSA area, wherein adolescents living in non-MSA areas were observed to have lower vaccination coverage when compared with those living in MSA principal cities with ≥1 dose MenACWY or meningococcal-unknown type vaccine
			Vaccine uptake	Physical environment	Geographic location/region	Proportion (%): ≥2 doses of MenACWY or meningococcal-unknown type vaccine: Metropolitan statistical area: Non-metropolitan statistical area: 50.1	There is inequality based on the MSA area, wherein adolescents living in MSA non-principal city areas were observed to have higher vaccination coverage when compared with those living in MSA principal cities with

						Metropolitan statistical area non-principal city: 58.5 Metropolitan statistical area principal city: 50.6 p<0.05	≥2 doses of MenACWY or meningococcal-unknown type vaccine.
			Vaccine uptake	Social and economic factors	Social deprivation	Proportion (%): ≥1 dose of MenACWY or meningococcal-unknown type vaccine: Below poverty level in non-metropolitan statistical area: 86.1 Below poverty level in metropolitan statistical area non-principal city: 87.2 Below poverty level in metropolitan statistical area principal city: 91.6 At or above poverty level in non-metropolitan statistical area: 85.6 At or above poverty level in metropolitan statistical area non-principal city: 90.2 At or above poverty level in metropolitan statistical area principal city: 89.4 p<0.05	There is inequality based on the MSA area with below/at or above poverty level, wherein adolescents living in non-MSA areas were observed to have lower vaccination coverage when compared with those living in MSA principal cities with ≥1 dose MenACWY or meningococcal-unknown type vaccine.
			Vaccine uptake	Social and economic factors	Social deprivation	Proportion (%): ≥2 doses of MenACWY or meningococcal-unknown type vaccine: Below poverty level in non-metropolitan statistical area: 47.4 Below poverty level in metropolitan statistical area non-principal city: 47.6 Below poverty level in metropolitan statistical area principal city: 48.6 At or above poverty level in non-metropolitan statistical area: 50.2 At or above poverty level in metropolitan statistical area non-principal city: 61.2 At or above poverty level in metropolitan statistical area principal city: 50.2 p<0.05	There is inequality based on the MSA area, wherein adolescents living in MSA non-principal city areas with at or above poverty level were observed to have higher vaccination coverage when compared with those living in MSA principal cities with ≥2 doses of MenACWY or meningococcal-unknown type vaccine>
			Vaccine uptake	Physical environment	Geographic location/region	Proportion (%): ≥1 dose of MenACWY or meningococcal-unknown type vaccine:	There is inequality based on the region, wherein statistically significant increase in vaccine coverage was observed for certain

						Region I: 95.1 Connecticut: 94.9 Maine: 93.7 Massachusetts: 96.4 New Hampshire: 91.1 Rhode Island: 96.2 Vermont: 91.0 Region II: 94.5 New Jersey: 96.2 New York: 93.7 NY–City of New York: 93.2 NY–Rest of State: 94.0 Region III: 91.4 Delaware: 89.8 Dist. of Columbia: 91.8 Maryland: 94.0 Pennsylvania: 95.5 PA–Philadelphia: 93.5 PA–Rest of State: 95.7 Virginia: 84.0 West Virginia: 91.4 Region IV: 85.7 Alabama: 82.7 Florida: 80.0 Georgia: 96.2 Kentucky: 94.2 Mississippi: 63.5 North Carolina: 94.4 South Carolina: 78.7 Tennessee: 83.2 Region V: 93.6 Illinois: 92.5 IL–City of Chicago: 89.7 IL–Rest of State: 93.0 Indiana: 94.9 Michigan: 95.7	regions namely, New Jersey, Minnesota, Texas, Texas-Rest of the state, South Dakota when compared to 2019.

						Minnesota: 94.3 Ohio: 93.4 Wisconsin: 90.2 Region VI: 90.0 Arkansas: 93.8 Louisiana: 90.1 New Mexico: 85.2 Oklahoma: 80.0 Texas: 91.2 TX–Bexar County: 90.6 TX–City of Houston: 89.2 TX–Rest of State: 91.4 Region VII: 86.4 Iowa: 90.7 (86.1–93.9) Kansas: 83.3 Missouri: 85.3 Nebraska: 87.3 Region VIII: 87.6 Colorado: 87.3 Montana: 75.8 North Dakota: 93.8 South Dakota: 94.2 Utah: 90.3 Wyoming: 73.3 Region IX: 85.5 Arizona: 87.3 California: 85.0 Hawaii: 86.0 Nevada: 87.2 Region X: 87.4 Alaska: 77.7 Idaho: 88.7 Oregon: 87.5 Washington: 88.1	

						Territory Guam: 70.4 Puerto Rico: 77.2 p<0.05	
			Vaccine uptake	Person's individual characteristics and behaviours	Ethnicity/Race	Proportion (%): ≥1 dose of MenACWY or meningococcal-unknown type vaccine: Non-Hispanic, White only: 89.3 Non-Hispanic, Black only: 89.4 Hispanic: 89.2 Non-Hispanic, American Indian/Alaska Native only: 93.3 Non-Hispanic, Asian: 89.2 Non-Hispanic, Multiracial: 89.9 P=NR	No analyses were performed.
			Vaccine uptake	Person's individual characteristics and behaviours	Ethnicity/Race	Proportion (%): ≥2 doses of MenACWY or meningococcal-unknown type vaccine: Non-Hispanic, White only: 58 Non-Hispanic, Black only: 46.8 Hispanic: 52.5 Non-Hispanic, American Indian/Alaska Native only: 63.8 Non-Hispanic, Asian: 51.9 Non-Hispanic, Multiracial: 47.5 p<0.05	There is inequality based on the race/ethnicity, wherein vaccination coverage was lower among non-Hispanic, Black adolescents compared with non-Hispanic, White ones with ≥2 doses of MenACWY or meningococcal-unknown type vaccine.
			Vaccine uptake	Social and economic factors	Insurance status and type	Proportion (%): ≥1 dose of MenACWY or meningococcal-unknown type vaccine: Private insurance only: 90.2 Any Medicaid: 88.6 Other insurance: 89 Uninsured: 85.5 p<0.05	There is an inequality in vaccination coverage by insurance status where lower vaccination coverage was observed among uninsured adolescents.
			Vaccine uptake	Social and economic factors	Insurance status and type	Proportion (%): ≥2 doses of MenACWY or meningococcal-unknown type vaccine: Private insurance only: 58.1 Any Medicaid: 50.6 Other insurance: 54.3	There is an inequality in vaccination coverage by insurance status where lower vaccination coverage was observed among uninsured adolescents.

						Uninsured: 35.5 p<0.05	
Srivastava, 2020[36]	Adult parents or guardians (aged within the range of 35-≥ 65 years) of ≥1 dependent aged 16 to 19 years	619 (Aware versus not aware of MenB vaccines)	Vaccine uptake	Person's individual characteristics and behaviours	Gender identity/sexual orientation	Females (reference) vs males OR: 0.43; 95% CI: 0.26-0.7	Sex was significantly associated with reduced MenB vaccine awareness, indicating male parents/guardians were mostly not aware of the MenB vaccines. There was an inequality in vaccine uptake due to sex in parents/guardians.
		619 (Aware versus not aware of MenB vaccines) 155 (Not Aware of MenB Vaccines)	Vaccine uptake	Person's individual characteristics and behaviours	Ethnicity/Race	Black and others, non-Hispanic (reference) vs White, non-Hispanic OR: 2.2; 95% CI: 1.09-4.46	Race/ethnicity was significantly associated with MenB vaccine awareness, indicating White, non-Hispanic parents/guardians were more aware of MenB vaccines than Black and others, non-Hispanic. There was an inequality in vaccine uptake due to race/ethnicity in parents/guardians.
		NR (Unaware but interested versus unaware and not	Vaccine uptake	Person's individual characteristics and behaviours	Ethnicity/Race	Black and others, non-Hispanic (reference) vs Hispanic OR: 5.05; 95% CI: 1.13-22.63	Race/ethnicity was significantly associated with MenB vaccine awareness, indicating Hispanic parents/guardians were more interested in vaccination than Black and others, non-Hispanic. There was an inequality in vaccine uptake due to race/ethnicity in parents/guardians.

		interested)					
		619 (Aware versus not aware of MenB vaccines) 155 (Not Aware of MenB Vaccines)	Vaccine uptake	Social and economic factors	Childhood development	Whether parents felt the HCP knew their child well (yes vs no) OR: 0.53; 95% CI: 0.30-0.96	Whether parents felt the HCP knew their child well (yes vs no) was significantly associated with MenB vaccine awareness/interest. There was an inequality in vaccine uptake based on whether parents felt the HCP knew their child well (yes vs no).
		312 (Aware of and Vaccinated/ Intend to Vaccinate)	Vaccine uptake	Social and economic factors	Insurance status and type	No insurance (reference) vs employer-based insurance OR: 3.34; 95% CI: 1.09-10.21 No insurance (reference) vs other insurance OR: 3.66; 95% CI: 1.06-12.66	Parents/guardians having some form of insurance had higher proportions of adolescents who were vaccinated. There was an inequality in vaccine uptake based on the insurance status of parents/guardians.