Determinants of Adults' Willingness to be Vaccinated to Prevent Lyme Disease in the United States

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BACKGROUND

- Lyme disease (LD) is a tick-borne illness caused by the bacterium *Borrelia burgdorferi*. Clinical manifestations of LD range from localized disease at the site of the tick bite (e.g., single erythema migrans [EM]) to more severe disseminated manifestations (e.g., multiple EM, cardiac and neurologic involvement).
- CDC estimates that 476,000 people in the US are diagnosed with Lyme Disease every year.[1]
- Lyme disease incidence is highest in states in the Northeast to mid-Atlantic and upper Midwest states, which are labeled high incidence states by CDC.[1,*]
- A Lyme disease vaccine is currently in development (NCT05477524).

***High incidence** : Virginia, West Virginia, Maryland, Delaware, Pennsylvania, New Jersey, New York, Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, Maine, Wisconsin, and Minnesota, Washington D.C. **Bordering:** Illinois, Indiana, Iowa, Kentucky, Michigan, North Carolina, North Dakota, Ohio, South Dakota, Tennessee.

STUDY INTRO / OBJECTIVES

- At the time of this study there was limited quantitative information on willingness to be vaccinated (WTV) and preferences for a LD vaccine; we were interested in understanding perceptions of a potential Lyme vaccine among the segment of the US population at high risk of disease or likely to be vaccinated including those who lived in or traveled to areas in which Lyme disease is or may be of high incidence.
- **Study Objectives**:
  - To identify factors associated with WTV against LD among adults in the United States
  - To quantify priorities for prevention of LD among the segment of the US population at risk of contracting LD or likely to be vaccinated including those living in and traveling to areas in which LD is or may be high incidence

METHODS

- Participants included US adults who:
  1) lived in high incidence of LD or bordering states or
  2) traveled to ≥1 high incidence state in the past year.
- Data collection took place from September–October 2021.
- Online survey panels were used to recruit participants.
- An adaptive self-explicated preference-elicitation survey was developed to assess the importance of 31 attributes related to LD and LD vaccines.[2]
- 10 key attributes related to LD vaccines were identified for this analysis.
  - The survey and attribute development were informed by the literature[3,4]
  - Qualitative interviews were conducted with US adults (n=10) meeting the eligibility criteria to determine understanding and confirm attributes
- Rating scales were used to understand general trends in willingness to be vaccinated to prevent LD.

Figure 1: Attributes

- 31 treatment attributes related to LD and vaccination to protect against LD were identified as relevant in qualitative interviews (shown below), key vaccine attributes (highlighted in orange) were included for analysis.

Efficacy
Duration of protection if you don't get all the vaccinations (2–12 months)
Duration of protection after you get all the vaccinations (1–5 years, for life)
Vaccine efficacy achieved, if you don't get all the vaccinations (55–85%)
Vaccine efficacy achieved, after you get all the vaccinations (65–95%)

Cost
Insurance coverage (fully out of pocket – no copay)
Out of pocket cost (none, $100–$500)

Accessibility & Production
Getting the vaccine at a doctor's office or pharmacy
Vaccine production (US/EU/Asia)

Safety & Tolerability
Can be administered with other vaccines (y/n)
Pain, swelling, and redness at injection site (none – severe)
Fever, headache after injection (none – severe)
Muscle and joint pain after injection (none – severe)
Risk of serious side effects (fairly common – very rare)
Ability for pregnant women to take (y/n/unknown)

Quality of Life & Recommendation
Difficulty working or going to school (low/no – significant)
Difficulty doing social and leisure activities (low/no – significant)
Difficulty doing activities expected in your family role (low/no – significant)
Impact of Lyme disease on overall quality of life (low/no – significant)
Vaccine recommendation from friends/family vs doctor
Size of clinical trial studies(1,000–100,000 people)
Age requirement for taking the vaccine (2–18 years & up)

Dosing & Administration
Dosing schedule (3–4 shots, distributed)
Requirement for booster (none, every 1–10 years)
Mode of administration (intramuscular/ subcutaneous)

Symptoms of Lyme Disease
Prevention of rash symptoms (y/n)
Prevention of early symptoms such as fever, fatigue, muscle aches, trouble thinking clearly (y/n)
Prevention of symptoms of heart trouble (y/n)
Prevention of meningitis/encephalitis (y/n)
Prevention of impact on nervous system (y/n)
Prevention of joint pain and swelling (y/n)
Prevention of persistent symptoms like pain, fatigue, and cognitive issues after treatment (y/n)

Figure 2: Critical Questions for Analysis

- To understand willingness to be vaccinated, respondents were asked the question "If an effective and safe vaccine was available for adults and children for the prevention of Lyme disease, how likely would you be to agree to take it?"
- Respondents who answered somewhat likely to agree (4) or completely likely to agree (5) were classified as "likely to agree"
- Respondents who answered completely unlikely to agree (1), somewhat unlikely to agree (2), and neither likely not unlikely (3) were classified as "unlikely to agree"
- Prespecified characteristics of interest were:
  - Activity Level, Area Living In (Wooded vs Non-Wooded), Education Level, State (High Incidence vs Not), Experience with Lyme Disease, Geography, Income, Occupational Exposure, Pets, Vaccine Views, and Age
  - These characteristics were used to determine if select subgroups of responders were more willing to vaccinate

If an effective and safe vaccine was available for adults and children for the prevention of Lyme disease, how likely would you be to agree to take it?

1 = Completely unlikely to agree	2 = Somewhat unlikely to agree	3 = Neither likely nor unlikely to agree	4 = Somewhat likely to agree	5 = Completely likely to agree
Unlikely to Agree			Likely to Agree	

RESULTS

Figure 3: Key Demographic Characteristics

- A total of 505 respondents located in the US and aged ≥18 participated in the survey.
- Approximately 4 of every 5 respondents (80.4%) had a college degree or higher.
- Nearly half (46.5%) lived in suburban areas.
- About ¾ of the sample was at least 40 years of age (74.7%).
- The sample predominantly identified as white (89.1%).

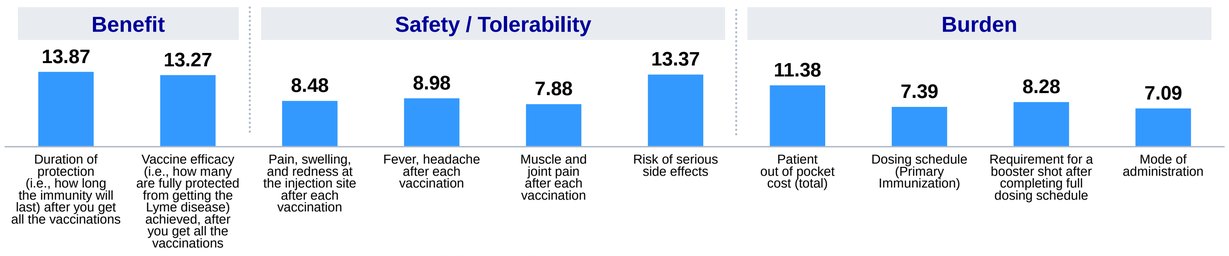
Category	Patient Segment	Sample Size N (%)
Gender	Male	201 (39.8%)
	Female	302 (59.8%)
	Prefer not to answer	3 (0.6%)
Education	College or higher education	406 (80.4%)
	High school or lower education	99 (19.6%)
State[a]	Lives in high incidence state	213 (42.2%)
	Lives in bordering state	202 (40.0%)
Geography	Urban	154 (30.5%)
	Rural	116 (23.0%)
	Suburban	235 (46.5%)
Income[b]	Mid-high income	315 (62.4%)
	Low income	167 (33.1%)
Age[c]	Younger	128 (25.3%)
	Older	377 (74.7%)

Category	Patient Segment	Sample Size N (%)
Marital Status	Married	325 (64.4%)
	Divorced	55 (10.9%)
	Single living with my parents	13 (2.6%)
	Single living on my own	87 (17.2%)
	Living with my domestic partner	26 (5.1%)
Number of Kids Living in the Household	No children living in household	295 (58.4%)
	1 child living in household	92 (18.2%)
	2 children living in household	87 (17.2%)
	3 children living in household	19 (3.8%)
	4 or more children living in household	13 (2.6%)
Race[d]	White	450 (89.1%)
	Other	56 (11.1%)

a) **High incidence** : Virginia, West Virginia, Maryland, Delaware, Pennsylvania, New Jersey, New York, Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, Maine, Wisconsin, and Minnesota, Washington D.C; **Bordering:** Illinois, Indiana, Iowa, Kentucky, Michigan, North Carolina, North Dakota, Ohio, South Dakota, Tennessee.
b) Low < $75K; ≥ mid-high $75k+. c) Younger < 40; Older ≥ 40. d) Other: Black or African American, Latin American or Hispanic, Native American or Alaska Native, Asian.

Figure 4: Importance Weights for Key Vaccine Attributes*

- The figure below shows the importance weights for a select sample of 10 attributes. Of 31 total attributes, the 10 selected are specific to vaccination and therefore can inform willingness to vaccinate.
- The three vaccine attributes rated most important were 1) efficacy 2) duration of efficacy and 3) and risk of serious side effects.
- The least important attributes were injection mode (subcutaneous or intramuscular) and dosing schedule.



*Importance weights represent the importance of one attribute relative to all other attributes. Importance weights sum to 100 across key attributes.

Figure 5: Willingness to be Vaccinated by Participant Characteristics

- In the figure below, the characteristics highlighted in green are associated with a higher WTV whereas those highlighted in orange indicate a lower WTV.
- The overall WTV was 65.3%.
- Characteristics associated with the highest WTV were prior LD (89.5%), positive vaccine views in general (80.2%), and occupational exposure to LD (79.1%).
- Participants living in high incidence and bordering states had 69% and 55.9% WTV, respectively.
- Characteristics associated with lower WTV were negative vaccine views (25.5%), low income (50.9%), and an education level of high school or less (51.5%).

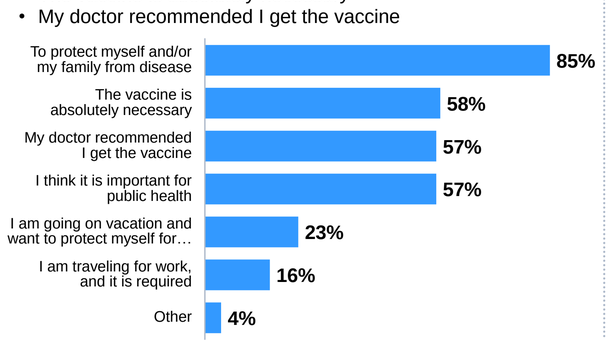
Key: Highest Willingness to Vaccinate; Lowest Willingness to Vaccinate

Category	Patient Segment	Sample size (n)	Percentage Unlikely to Agree	Percentage Likely to Agree
Overall	**Overall**	**505**	**34.7%**	**65.3%**
Activity Level	Active (Engages in Activity)	324	27.8%	72.2%
	Inactive (Does not engage in activity)	181	47.0%	53.0%
Wooded	Does not live in wooded area	200	46.5%	53.5%
	Lives in wooded area	305	26.9%	73.1%
Education	College or higher education	406	31.3%	68.7%
	High school or lower education	99	48.5%	51.5%
State	Lives in high incidence state	213	31.0%	69.0%
	Lives in bordering state	202	44.1%	55.9%
Experience	**Contracted Lyme disease**	**57**	**10.5%**	**89.5%**
	Known or little knowledge of Lyme disease	448	37.7%	62.3%
Occupational Exposure	Does not have occupational exposure	390	38.7%	61.3%
	Has occupational exposure	115	20.9%	79.1%
Geography	Urban	154	24.0%	76.0%
	Rural	116	40.5%	59.5%
	Suburban	235	38.7%	61.3%
Income	Mid-high income	315	26.0%	74.0%
	Low income	167	49.1%	50.9%
Pet	Pet goes outdoors	245	24.9%	75.1%
	Pet does not go outdoors	260	43.8%	56.2%
Vaccine Views	Positive vaccine views	368	19.8%	80.2%
	Negative vaccine views	**137**	**74.5%**	**25.5%**
Age	Younger	128	23.4%	76.6%
	Older	377	38.5%	61.5%
Race	White	450	35.1%	64.9%
	Other	56	30.4%	70.4%

Figure 6: Exercise

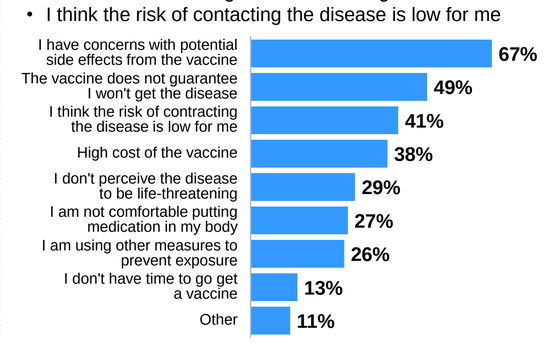
When asked the top three reasons respondents **WOULD** take the vaccine, the top 3 answers were

- To protect myself and/or my family
- The vaccine is absolutely necessary
- My doctor recommended I get the vaccine



When asked the top three reasons respondents **WOULD NOT** take the vaccine, the top 3 answers were

- I have concerns with potential side effects from the vaccine
- The vaccine doesn't guarantee I won't get the disease
- I think the risk of contacting the disease is low for me



NOTE: Each of the options shown in the charts above were presented to participants. They were then asked to rank their top 3 reasons they would/would not take a vaccine, in no particular order.

CONCLUSIONS

- Most people with greater risk of geographic exposure to LD would be willing to take an effective and safe vaccine for preventing LD if it were available.
- WTV differed by perceived exposure to LD, attitude toward vaccines in general, and potential risk factors for LD.
- More research is needed, for example a more rigorous patient preference study to elicit tradeoffs and to confirm the importance of key vaccine attributes.
- Effectively communicating the risk of LD and the efficacy and safety of LD vaccines to those at risk may increase WTV and thereby reduce LD incidence and burden.

LIMITATIONS

- The questions in this survey presented hypothetical situations. The trade-offs and statements related to willingness to be vaccinated which were elicited in this study may not predict real-world behavior.
- Respondents were predominantly white (89%) and had at least a college degree (80.4%); therefore, generalizability to the broader US population may be limited.

DISCLOSURES / COIs

Arun Balaji: employment with Pfizer; **Josh Coulter:** employment with Pfizer; **Mendwas Dzingina:** employment with Pfizer; **Lia Franco:** former employment with Pfizer; **Brett Hauber:** employment with Pfizer; **Amanda R. Mercadante:** employment with Pfizer; **Sarah Pugh:** employment with Pfizer; **James Stark:** employment with Pfizer; **Holly Yu:** employment with Pfizer.

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REFERENCES

1. Lyme Disease Surveillance and Data | Lyme Disease | CDC; 2. Netzer O, Srinivasan V. Adaptive Self-Explication of Multiattribute Preferences. *Journal of Marketing Research*. 2011;48(1):140-156; 3. Nigrovic LE, Thompson KM. The Lyme vaccine: a cautionary tale. *Epidemiol Infect*. 2007 Jan;135(1):1-8; 4. Aenishaenslin, C., Hongoh, V., Cissé, H.D. et al. Multi-criteria decision analysis as an innovative approach to managing zoonoses: results from a study on Lyme disease in Canada. *BMC Public Health* 13, 897 (2013).