

## **Market and Non-Market Productivity Losses Associated with Invasive Meningococcal Disease in the United States**

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**SUPPLEMENTARY APPENDIX**

## SUPPLEMENTARY TABLES

**Table S1.** Daily activities associated with productivity losses – all days, annual 2022 estimates

| Time spent per activity (hours) [1]                        |       |       |       |       |       |       |       |       |                     |                         |                 |
|------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|---------------------|-------------------------|-----------------|
| Age group (years)                                          |       |       |       |       |       |       |       |       | Category            |                         |                 |
| Activity                                                   | 16–19 | 20–24 | 25–34 | 35–44 | 45–54 | 55–64 | 65–74 | 75+   | Market productivity | Non-market productivity | No productivity |
| Personal care activities (includes travel)                 | 10.53 | 10.40 | 9.86  | 9.46  | 9.50  | 9.51  | 9.72  | 10.09 |                     | ✓                       |                 |
| Eating and drinking (includes travel)                      | 1.24  | 1.21  | 1.24  | 1.18  | 1.16  | 1.23  | 1.26  | 1.42  |                     | ✓                       |                 |
| Household activities (includes travel)                     | 0.79  | 1.16  | 1.68  | 1.80  | 1.98  | 2.13  | 2.61  | 2.54  |                     | ✓                       |                 |
| Purchasing goods and services (includes travel)            | 0.43  | 0.51  | 0.58  | 0.62  | 0.69  | 0.82  | 0.79  | 0.71  |                     | ✓                       |                 |
| Caring for and helping household members (includes travel) | 0.13  | 0.22  | 0.82  | 1.21  | 0.48  | 0.18  | 0.08  | 0.13  |                     | ✓                       |                 |

| Time spent per activity (hours) [1]                             |       |       |       |       |       |       |       |      |                     |                         |                 |
|-----------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|------|---------------------|-------------------------|-----------------|
| Age group (years)                                               |       |       |       |       |       |       |       |      | Category            |                         |                 |
| Activity                                                        | 16–19 | 20–24 | 25–34 | 35–44 | 45–54 | 55–64 | 65–74 | 75+  | Market productivity | Non-market productivity | No productivity |
| Caring for and helping nonhouseholder members (includes travel) | 0.09  | 0.09  | 0.11  | 0.13  | 0.15  | 0.30  | 0.31  | 0.17 |                     | ✓                       |                 |
| Working and work-related activities (includes travel)           | 1.13  | 3.43  | 4.90  | 4.78  | 5.16  | 3.86  | 1.27  | 0.41 | ✓                   |                         |                 |
| Educational activities (includes travel)                        | 3.46  | 1.03  | 0.19  | 0.13  | 0.07  | 0.05  | 0.05  | 0    |                     |                         | ✓               |
| Organizational, civic, and religious activities                 | 0.18  | 0.14  | 0.16  | 0.16  | 0.27  | 0.28  | 0.46  | 0.48 |                     | ✓                       |                 |
| Leisure and sports (includes travel)                            | 5.67  | 5.43  | 4.15  | 4.15  | 4.20  | 5.28  | 6.99  | 7.48 |                     |                         | ✓               |
| Telephone calls, mail, and e-mail (includes travel)             | 0.15  | 0.17  | 0.11  | 0.12  | 0.14  | 0.16  | 0.25  | 0.29 |                     |                         | ✓               |

| Time spent per activity (hours) [1]                                                       |       |       |       |       |       |       |       |      |                     |                         |                 |
|-------------------------------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|------|---------------------|-------------------------|-----------------|
| Age group (years)                                                                         |       |       |       |       |       |       |       |      | Category            |                         |                 |
| Activity                                                                                  | 16–19 | 20–24 | 25–34 | 35–44 | 45–54 | 55–64 | 65–74 | 75+  | Market productivity | Non-market productivity | No productivity |
| Other activities, not elsewhere classified (includes miscellaneous travel and data codes) | 0.20  | 0.21  | 0.21  | 0.25  | 0.19  | 0.19  | 0.19  | 0.27 |                     |                         | ✓               |

**Table S2.** Weekly median earnings (market and non-market productivity) – 2023  
BLS Q2 data

| Age group (years)                          | Weekly median earnings [2, 3] |
|--------------------------------------------|-------------------------------|
| <b>Market productivity</b>                 |                               |
| 16–19                                      | \$603.00                      |
| 20–24                                      | \$712.00                      |
| 25–34                                      | \$1,042.00                    |
| 35–44                                      | \$1,229.00                    |
| 45–54                                      | \$1,233.00                    |
| 55–64                                      | \$1,186.00                    |
| 65–74                                      | \$1,101.00                    |
| 75+                                        | \$1,101.00                    |
| <b>Non-market productivity<sup>a</sup></b> |                               |
| 16–19                                      | \$560.00                      |
| 20–24                                      | \$560.00                      |
| 25–34                                      | \$560.00                      |
| 35–44                                      | \$560.00                      |
| 45–54                                      | \$560.00                      |
| 55–64                                      | \$560.00                      |
| 65–74                                      | \$560.00                      |
| 75+                                        | \$560.00                      |

<sup>a</sup> Weekly median earnings for non-market productivity calculated by multiplying the unadjusted hourly wage rate for non-market productivity (\$14.00) by 40 hours (assuming 40-hour work week).

**Abbreviations:** BLS, Bureau of Labor Statistics; Q2, second quarter.

**Table S3.** Number of IMD cases in the years during 2015–2021

| Age group<br>(years) | Cases [4-9] [10] |      |      |      |      |      |      |
|----------------------|------------------|------|------|------|------|------|------|
|                      | 2015             | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
| 16–23                | 38               | 59   | 55   | 24   | 26   | 17   | 7    |
| 24–44                | 66               | 64   | 54   | 49   | 61   | 33   | 47   |
| 45–64                | 63               | 61   | 56   | 68   | 71   | 54   | 43   |
| 65+                  | 51               | 51   | 60   | 62   | 73   | 33   | 24   |
| <b>Total</b>         | 218              | 235  | 225  | 203  | 231  | 137  | 121  |

**Abbreviations:** IMD, invasive meningococcal disease.

**Table S4.** Case-fatality rates

| Case-fatality rate [11] by serogroups |             |                           |
|---------------------------------------|-------------|---------------------------|
| Age group (years)                     | Serogroup B | Serogroups A, C, W, and Y |
| 16–23                                 | 11.71%      | 14.92%                    |
| 24–44                                 | 10.45%      | 19.27%                    |
| 45–64                                 | 10.71%      | 14.93%                    |
| 65+                                   | 21.43%      | 17.05%                    |

**Table S5.** Proportion of patients experiencing sequelae – scenario analysis utilizing alternative sequelae rates from two additional studies (Scenario 1)

| <b>Sequelae: Davis et al [12]</b> | <b>Proportion<sup>a</sup></b> | <b>Sequelae: Ortega-Sanchez et al [13]</b> | <b>Proportion</b> |
|-----------------------------------|-------------------------------|--------------------------------------------|-------------------|
| Seizure                           | 9.02%                         | Skin scarring                              | 7.60%             |
| Stroke                            | 7.85%                         | Amputation (single)                        | 1.90%             |
| Hearing loss                      | 6.03%                         | Amputation (multiple)                      | 1.20%             |
| Chronic renal failure             | 5.64%                         | Hearing loss                               | 8.80%             |
| Epilepsy                          | 3.76%                         | Long-term neurological disability          | 2.10%             |
| Anoxic brain damage               | 2.66%                         | NR                                         | NR                |
| Limb amputation                   | 1.10%                         | NR                                         | NR                |
| Skin necrosis/skin grafting       | 1.10%                         | NR                                         | NR                |
| Quadriparesis                     | 1.10%                         | NR                                         | NR                |
| Obstructive hydrocephalus         | 0.78%                         | NR                                         | NR                |
| Ataxia                            | 0.65%                         | NR                                         | NR                |
| Blindness                         | 0.65%                         | NR                                         | NR                |
| Learning disabilities             | 0.65%                         | NR                                         | NR                |

<sup>a</sup> As a conservative approach so as to avoid double counting productivity losses, the sequelae proportions reported by Davis et al. were adjusted by a factor of 64.87%; the adjustment factor was calculated by dividing the percentage of IMD patients experiencing at least one sequela (41%) by the sum of all sequelae probabilities (63.2%).

**Abbreviations:** IMD, invasive meningococcal disease; NR, not reported.

**Table S6.** Lifetime market and non-market productivity losses due to IMD cases occurring in 2021 – patients and caregivers – scenario analysis adjusting the market and non-market productivity wage rates using 2023 employer-paid benefits BLS data (Scenario 3)

| <b>Patient</b>           |                     |                                                               |                    |                                                               |                        |
|--------------------------|---------------------|---------------------------------------------------------------|--------------------|---------------------------------------------------------------|------------------------|
| <b>Age group (years)</b> | <b>Market</b>       |                                                               | <b>Non-market</b>  |                                                               | <b>Total</b>           |
|                          | <b>Acute</b>        | <b>Premature death, reduced life expectancy, and sequelae</b> | <b>Acute</b>       | <b>Premature death, reduced life expectancy, and sequelae</b> |                        |
| 16–23                    | \$2,123.46          | \$1,357,013.51                                                | \$1,385.04         | \$993,326.26                                                  | \$2,353,848.26         |
| 24–44                    | \$50,121.85         | \$33,831,261.23                                               | \$18,077.50        | \$12,201,954.36                                               | \$46,101,414.92        |
| 45–64                    | \$55,772.76         | \$28,886,280.11                                               | \$20,217.19        | \$10,471,053.52                                               | \$39,433,323.58        |
| 65+                      | \$5,975.42          | \$682,351.77                                                  | \$14,500.04        | \$2,101,852.28                                                | \$2,804,679.52         |
| <b>Total</b>             | <b>\$113,993.49</b> | <b>\$64,756,906.62</b>                                        | <b>\$54,179.77</b> | <b>\$25,768,186.41</b>                                        | <b>\$90,693,266.29</b> |
| <b>Caregiver</b>         |                     |                                                               |                    |                                                               |                        |
| <b>Age group (years)</b> | <b>Market</b>       |                                                               | <b>Non-market</b>  |                                                               | <b>Total</b>           |
|                          | <b>Acute</b>        | <b>Sequelae</b>                                               | <b>Acute</b>       | <b>Sequelae</b>                                               |                        |
| 16–23                    | \$2,123.46          | \$40,188.71                                                   | \$1,385.04         | \$25,034.64                                                   | \$68,731.85            |
| 24–44                    | \$50,121.85         | \$846,479.86                                                  | \$18,077.50        | \$305,300.73                                                  | \$1,219,979.92         |
| 45–64                    | \$55,772.76         | \$762,034.72                                                  | \$20,217.19        | \$291,819.95                                                  | \$1,129,844.63         |
| 65+                      | \$5,975.42          | \$19,601.06                                                   | \$14,500.04        | \$175,603.28                                                  | \$215,679.81           |
| <b>Total</b>             | <b>\$113,993.49</b> | <b>\$1,668,304.35</b>                                         | <b>\$54,179.77</b> | <b>\$797,758.61</b>                                           | <b>\$2,634,236.21</b>  |

**Abbreviations:** BLS, Bureau of Labor Statistics.

**Table S7.** Univariate sensitivity analysis parameters (20% variation from mean)

| <b>General inputs</b>       | <b>Base case</b>   | <b>Upper</b> | <b>Lower</b> | <b>Source</b> |
|-----------------------------|--------------------|--------------|--------------|---------------|
| Learning disabilities       | 0.65% <sup>a</sup> | 0.7785%      | 0.5190%      | [12]          |
| Blindness                   | 0.65% <sup>a</sup> | 0.7785%      | 0.5190%      | [12]          |
| Ataxia                      | 0.65% <sup>a</sup> | 0.7785%      | 0.5190%      | [12]          |
| Obstructive hydrocephalus   | 0.78% <sup>a</sup> | 0.9342%      | 0.6228%      | [12]          |
| Quadriparesis               | 1.10% <sup>a</sup> | 1.3234%      | 0.8823%      | [12]          |
| Skin necrosis/skin grafting | 1.10% <sup>a</sup> | 1%           | 1%           | [12]          |
| Limb amputation             | 1.10% <sup>a</sup> | 1%           | 1%           | [12]          |
| Anoxic brain damage         | 2.66% <sup>a</sup> | 3%           | 2%           | [12]          |
| Epilepsy                    | 3.76% <sup>a</sup> | 5%           | 3%           | [12]          |
| Chronic renal failure       | 5.64% <sup>a</sup> | 7%           | 5%           | [12]          |
| Hearing loss                | 6.03% <sup>a</sup> | 7%           | 5%           | [12]          |
| Stroke                      | 7.85% <sup>a</sup> | 9%           | 6%           | [12]          |
| Seizure                     | 9.02% <sup>a</sup> | 11%          | 7%           | [12]          |

| <b>General inputs</b>                                                     | <b>Base case</b> | <b>Upper</b> | <b>Lower</b> | <b>Source</b> |
|---------------------------------------------------------------------------|------------------|--------------|--------------|---------------|
| Case fatality (serogroups C, W, and Y) <sup>b</sup><br>65–99 years of age | 17.05%           | 20%          | 14%          | [11]          |
| Case fatality (serogroups C, W, and Y) <sup>b</sup><br>40–64 years of age | 14.93%           | 18%          | 12%          | [11]          |
| Case fatality (serogroups C, W, and Y) <sup>b</sup><br>23–39 years of age | 19.27%           | 23%          | 15%          | [11]          |
| Case fatality (serogroups C, W, and Y) <sup>b</sup><br>16–22 years of age | 14.92%           | 18%          | 12%          | [11]          |
| Case fatality (serogroup B)<br>65–99 years of age                         | 21.43%           | 26%          | 17%          | [11]          |
| Case fatality (serogroup B)<br>40–64 years of age                         | 10.71%           | 13%          | 9%           | [11]          |
| Case fatality (serogroup B)<br>23–39 years of age                         | 10.45%           | 13%          | 8%           | [11]          |
| Case fatality (serogroup B)<br>16–22 years of age                         | 11.71%           | 14%          | 9%           | [11]          |
| Manifestation bacteremic pneumonia                                        | 15.00%           | 18%          | 12%          | [14]          |

| <b>General inputs</b>                                              | <b>Base case</b> | <b>Upper</b> | <b>Lower</b> | <b>Source</b> |
|--------------------------------------------------------------------|------------------|--------------|--------------|---------------|
| Manifestation septicemia                                           | 30.00%           | 36%          | 24%          | [14]          |
| Manifestation meningitis                                           | 50.00%           | 60%          | 40%          | [14]          |
| Ratio of total benefits (non-market productivity)                  | 1.1787           | 1.41444      | 0.94296      | [2]           |
| Mean annual compensation female                                    | \$11.00/hour     | 13.2         | 8.8          | [2]           |
| Mean annual compensation male                                      | \$11.66/hour     | 13.992       | 9.328        | [2]           |
| Weekly median earnings (market productivity)<br>75+ years of age   | \$1,101.00       | \$1,321.20   | \$880.80     | [3]           |
| Weekly median earnings (market productivity)<br>65–74 years of age | \$1,101.00       | \$1,321.20   | \$880.80     | [3]           |
| Weekly median earnings (market productivity)<br>55–64 years of age | \$1,186.00       | \$1,423.20   | \$948.80     | [3]           |
| Weekly median earnings (market productivity)<br>45–54 years of age | \$1,233.00       | \$1,479.60   | \$986.40     | [3]           |

| General inputs                                                     | Base case  | Upper      | Lower    | Source |
|--------------------------------------------------------------------|------------|------------|----------|--------|
| Weekly median earnings (market productivity)<br>35–44 years of age | \$1,229.00 | \$1,474.80 | \$983.20 | [3]    |
| Weekly median earnings (market productivity)<br>25–34 years of age | \$1,042.00 | \$1,250.40 | \$833.60 | [3]    |
| Weekly median earnings (market productivity)<br>20–24 years of age | \$712.00   | \$854.40   | \$569.60 | [3]    |
| Weekly median earnings (market productivity)<br>16–19 years of age | \$603.00   | \$723.60   | \$482.40 | [3]    |

<sup>a</sup> As a conservative approach so as to avoid double counting productivity losses, the sequelae proportions reported by Davis et al. were adjusted by a factor of 64.87%; the adjustment factor was calculated by dividing the percentage of IMD patients experiencing at least one sequela (41%) by the sum of all sequelae probabilities (63.2%). <sup>b</sup> Serogroup A was excluded from case fatality inputs due to low incidence in the US [15].

**Abbreviations:** IMD, invasive meningococcal disease; US, United States.

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