

1 Supporting Information for
2 Human-associated fecal qPCR measurements and simulated risk of gastrointestinal
3 illness in recreational waters contaminated with raw sewage

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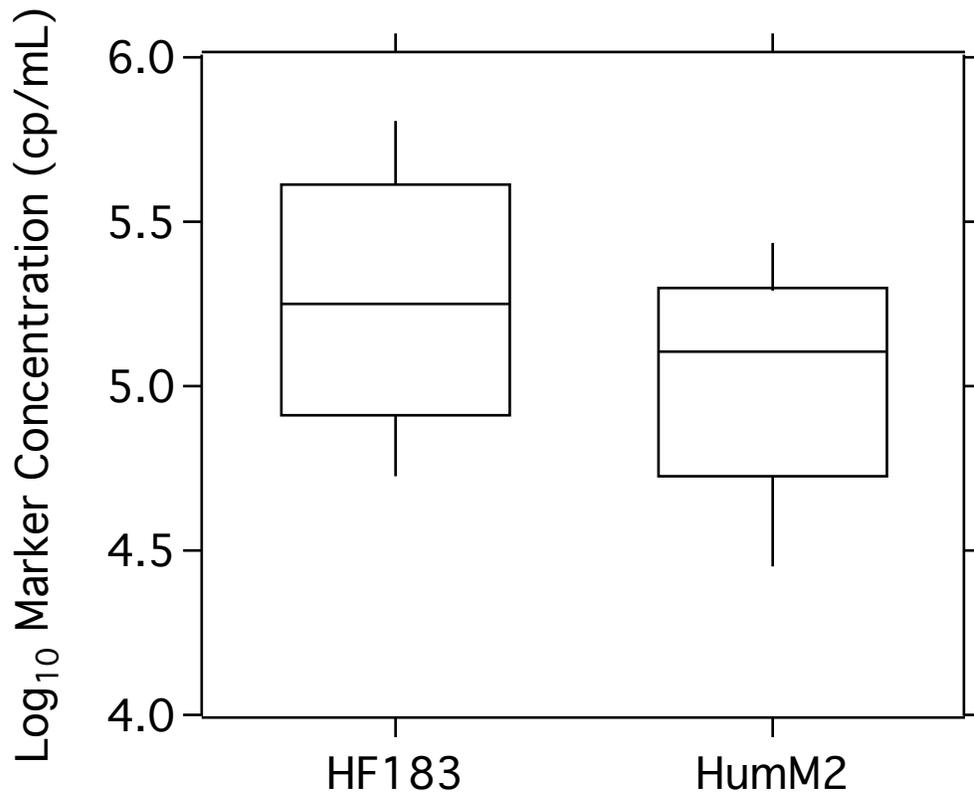
13 A manuscript

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15 *Environmental Science & Technology Letters*

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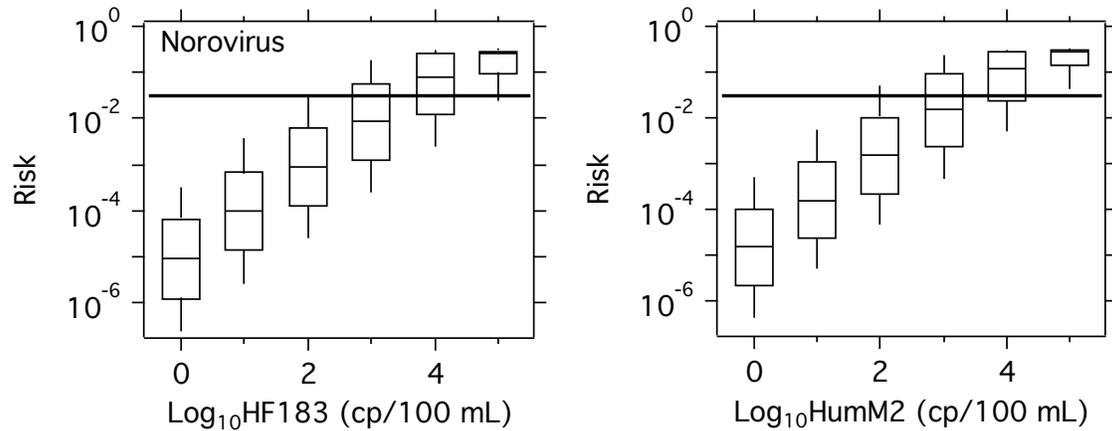
20 **Human qPCR Marker Concentration Estimates in Raw Sewage**
21 Shanks et al.¹ previously reported concentrations of HF183 and HumM2 qPCR markers
22 in raw sewage collected from 54 wastewater treatment plants throughout the United
23 States. Results were reported as the estimated log₁₀ copies (cp) per ng total nucleic acids.
24 The concentration of total nucleic acids was measured for each DNA extract using a
25 NanoDrop ND-1000 UV spectrophotometer (NanoDrop Technologies, Wilmington, DE)
26 as previously reported¹. Using this concentration (ng total nucleic acids per μL of DNA
27 extract), the total elution volume (100 μL), and the volume of sewage filtered (25 mL per
28 sample), the concentration of each human qPCR marker in cp/mL sewage was estimated.
29 The distribution of estimated concentrations for the two human-associated qPCR markers
30 is shown in Figure S1.
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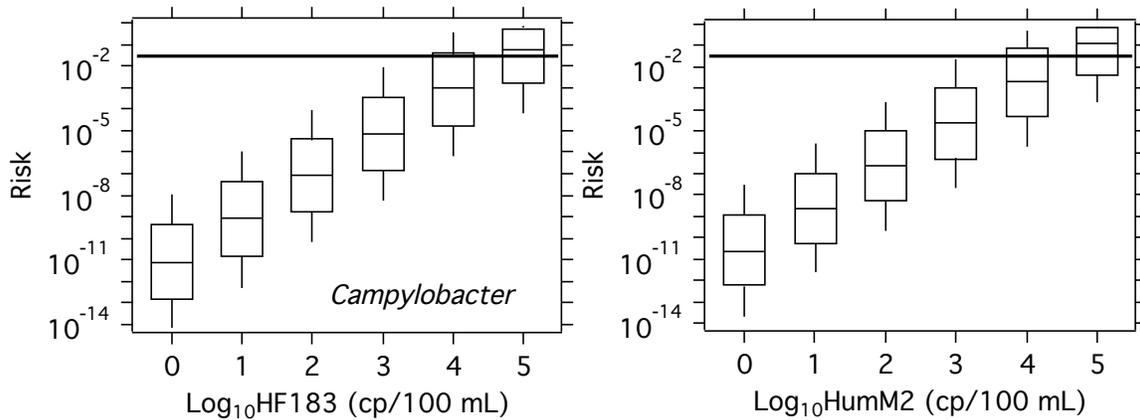
32 **Figure S1.** Distribution of human-associated qPCR markers in sewage at 54 geographical
33 locations across the US. Box and whiskers indicate median (line in middle of box), 25th
34 and 75th percentile (bottom and top of box, respectively), and 10th and 90th percentile
35 (bottom and top of whisker, respectively).
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39 **GI Illness Risk From Exposure to Individual Pathogens**

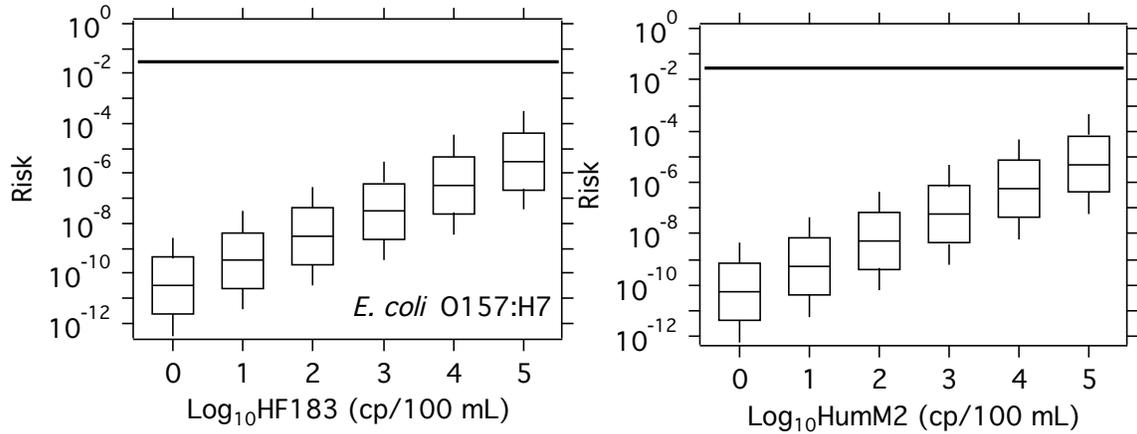
40 The risk of GI illness from exposure to each of the individual pathogens is shown in
41 Figures S2-S7.
42



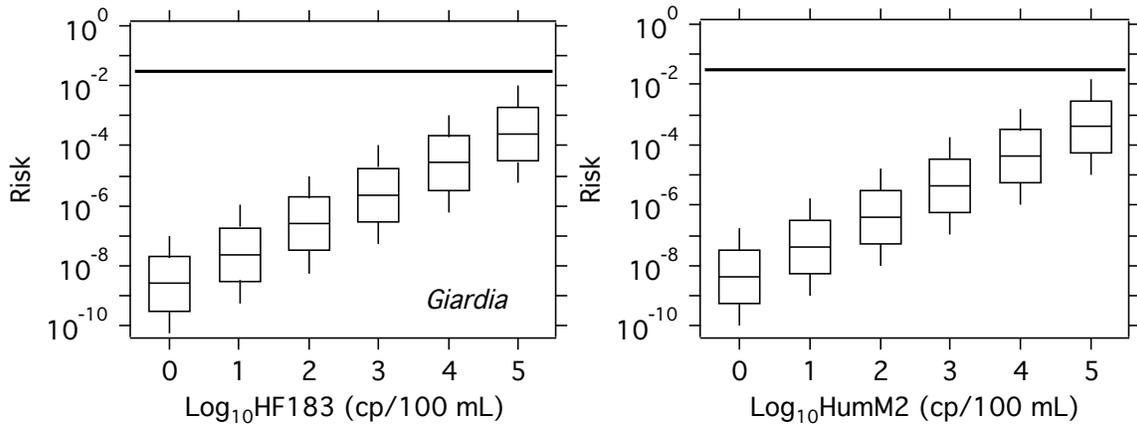
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 44 Figure S2. Left panel. GI risk from norovirus as a function of concentration of
 45 HF183Taqman marker in ambient water. Right panel. GI risk from norovirus as a
 46 function of concentration of HumM2 marker in ambient water. cp is copy. Box and
 47 whiskers indicate median (line in middle of box), 25th and 75th percentile (bottom and top
 48 of box, respectively), and 10th and 90th percentile (bottom and top of whisker,
 49 respectively). The horizontal line indicates a risk of 0.03 which is approximately the
 50 USEPA benchmark risk of ~30 GI per 1000 swimmers.
 51



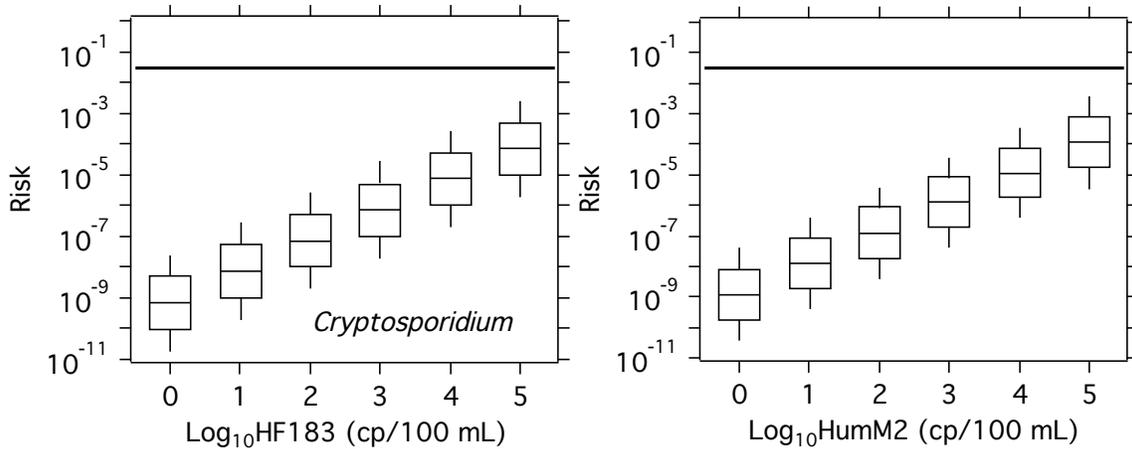
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 53 Figure S3. Left panel. GI risk from *Campylobacter* as a function of concentration of
 54 HF183Taqman marker in ambient water. Right panel. GI risk from *Campylobacter* as a
 55 function of concentration of HumM2 marker in ambient water. cp is copy. Box and
 56 whiskers indicate median (line in middle of box), 25th and 75th percentile (bottom and top
 57 of box, respectively), and 10th and 90th percentile (bottom and top of whisker,
 58 respectively). The horizontal line indicates a risk of 0.03 which is approximately the
 59 USEPA benchmark risk of ~30 GI per 1000 swimmers.
 60



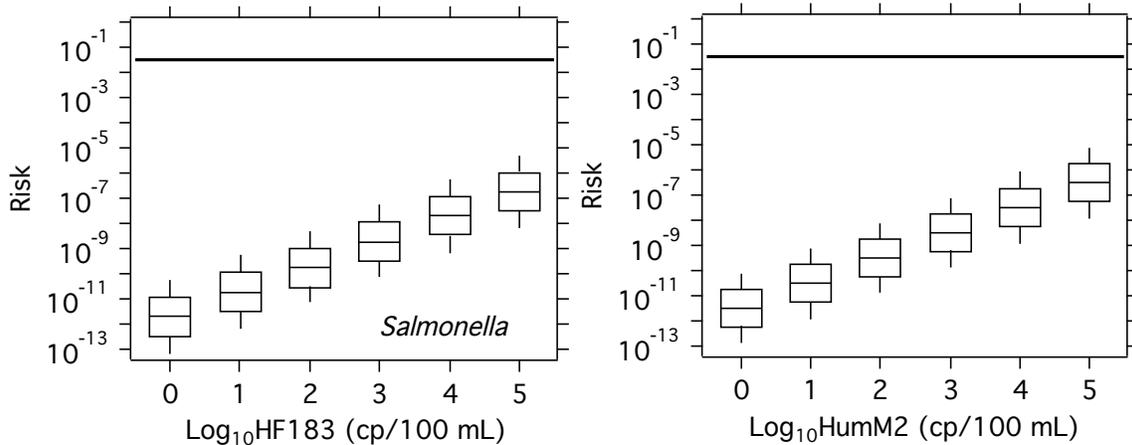
61
 62 Figure S4. Left panel. GI risk from *E. coli* O157:H7 as a function of concentration of
 63 HF183Taqman marker in ambient water. Right panel. GI risk from *E. coli* O157:H7 as a
 64 function of concentration of HumM2 marker in ambient water. cp is copy. Box and
 65 whiskers indicate median (line in middle of box), 25th and 75th percentile (bottom and top
 66 of box, respectively), and 10th and 90th percentile (bottom and top of whisker,
 67 respectively). The horizontal line indicates a risk of 0.03 which is approximately the
 68 USEPA benchmark risk of ~30 GI per 1000 swimmers.
 69



70
 71 Figure S5. Left panel. GI risk from *Giardia* as a function of concentration of
 72 HF183Taqman marker in ambient water. Right panel. GI risk from *Giardia* as a
 73 function of concentration of HumM2 marker in ambient water. cp is copy. Box and whiskers
 74 indicate median (line in middle of box), 25th and 75th percentile (bottom and top of box,
 75 respectively), and 10th and 90th percentile (bottom and top of whisker, respectively). The
 76 horizontal line indicates a risk of 0.03 which is approximately the USEPA benchmark
 77 risk of ~30 GI per 1000 swimmers.
 78
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 81 Figure S6. Left panel. GI risk from *Cryptosporidium* as a function of concentration of
 82 HF183Taqman marker in ambient water. Right panel. GI risk from *Cryptosporidium* as a
 83 function of concentration of HumM2 marker in ambient water. cp is copy. Box and
 84 whiskers indicate median (line in middle of box), 25th and 75th percentile (bottom and top
 85 of box, respectively), and 10th and 90th percentile (bottom and top of whisker,
 86 respectively). The horizontal line indicates a risk of 0.03 which is approximately the
 87 USEPA benchmark risk of ~30 GI per 1000 swimmers.
 88



89
 90 Figure S7. Left panel. GI risk from *Salmonella* as a function of concentration of
 91 HF183Taqman marker in ambient water. Right panel. GI risk from *Salmonella* as a
 92 function of concentration of HumM2 marker in ambient water. cp is copy. Box and
 93 whiskers indicate median (line in middle of box), 25th and 75th percentile (bottom and top
 94 of box, respectively), and 10th and 90th percentile (bottom and top of whisker,
 95 respectively). The horizontal line indicates a risk of 0.03 which is approximately the
 96 USEPA benchmark risk of ~30 GI per 1000 swimmers.
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98 References

99 (1) Shanks, O. C.; White, K.; Kelty, C. A.; Sivaganesan, M.; Blannon, J.; Meckes, M.;
 100 Varma, M.; Haugland, R. A. Performance of PCR-Based Assays Targeting

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