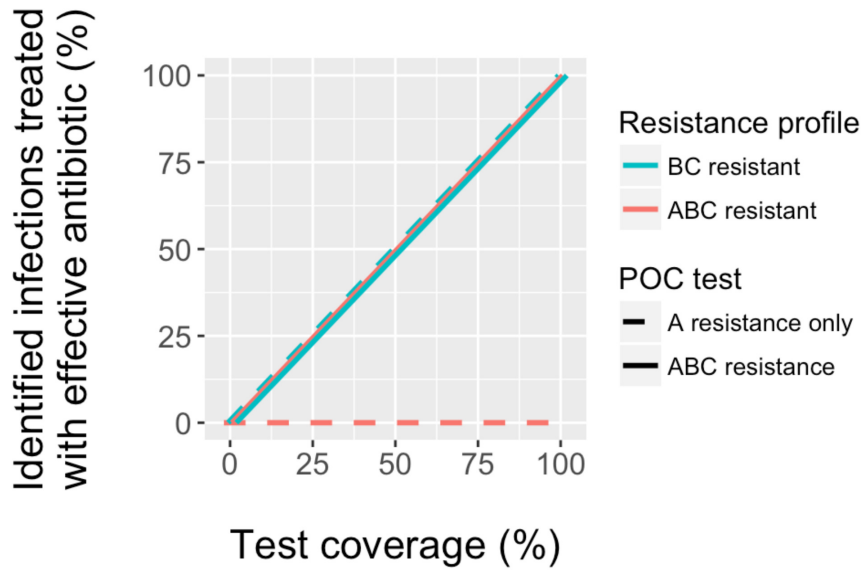
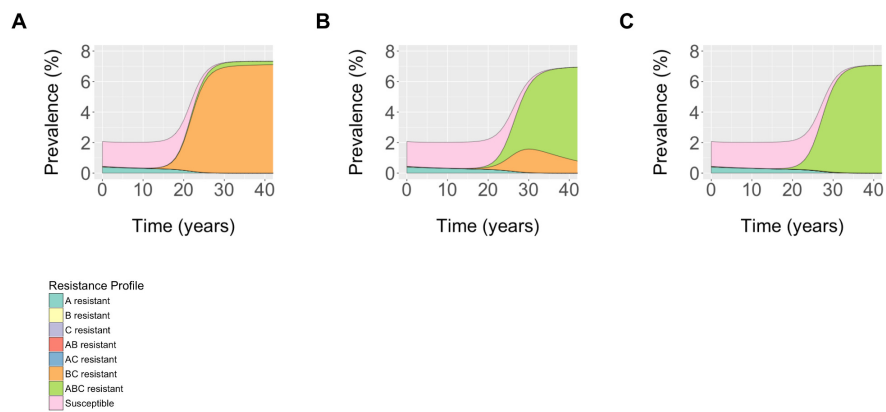


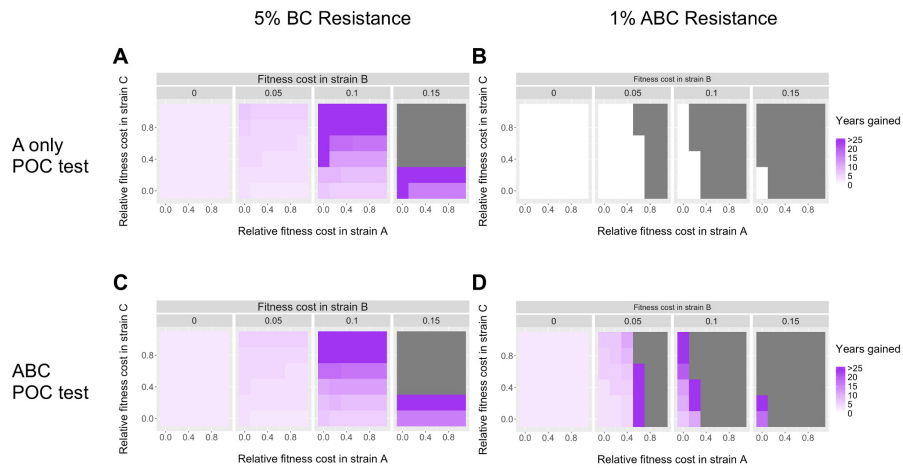
## Supplementary Figures and Tables



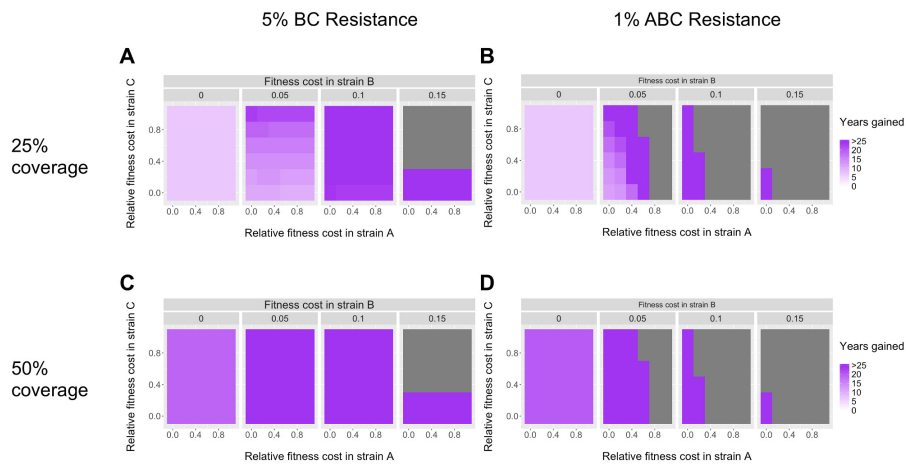
**Figure S1. Probability of effective treatment with different POC tests.** The probability that a BC or ABC resistant case receives an effective antibiotic is shown as test coverage is increased, with a POC test for A resistance only or resistance to all three antibiotics. Results are shown for tests with perfect sensitivity and specificity.



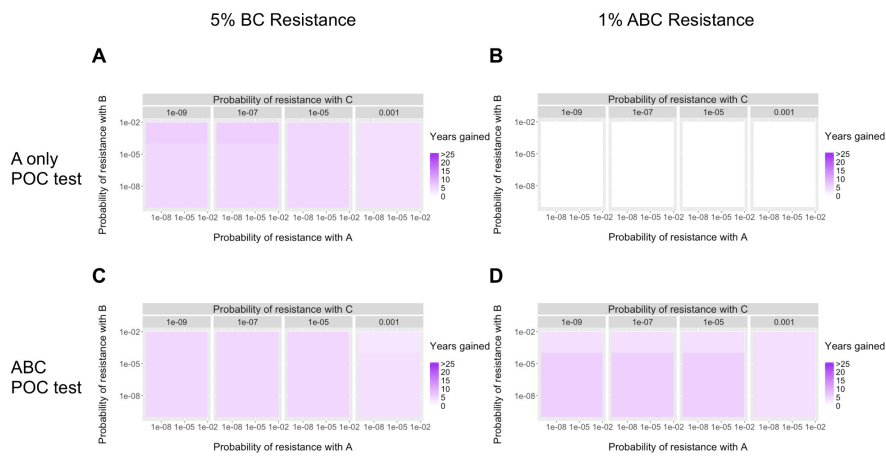
**Figure S2.** Model-projected gonorrhea prevalence with different levels of use of a point-of-care test for detecting single antibiotic resistance and reduced fitness for A resistant isolates. Population prevalence and prevalence of different strains is shown in the face of (A) No POC testing, (B) 10% of cases tested, and (C) 25% of cases tested. The fitness cost associated with antibiotic A resistance was 0.01. Fitness costs associated with resistance to the other antibiotics were unchanged from base case values. Cases undergoing testing and displaying susceptibility to antibiotic A were treated with antibiotic A; those displaying resistance to A were treated with combination BC. All untested cases were treated in combination with antibiotics B and C.



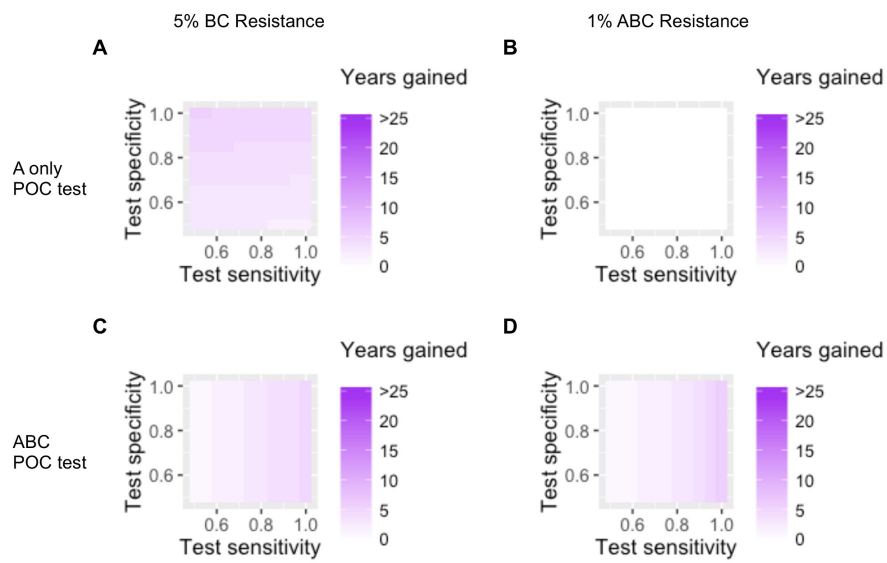
**Figure S3.** Model-projected gonorrhoea prevalence with different levels of use of a point-of-care test for detecting single antibiotic resistance and reduced fitness for A resistant isolates. Impact of varying strain fitness on delays to resistance establishment with a point-of-care test. (A,C) Additional years for BC resistant strains to represent 5% of prevalent strains. (B,D) Additional years for ABC resistant strains to represent 1% of prevalent strains. A POC test determining resistance to (A,B) antibiotic A only, or (C,D) all three antibiotics was used for 10% of identified cases, with additional years gained calculated relative to no test use in the population. Detected cases are treated with combination BC therapy in the absence of a POC test. Fitness costs associated with resistance to antibiotic B are shown along the top panel. Fitness costs associated with resistance to antibiotics A and C are calculated as relative fitness costs, as described in Methods, with 0 representing no fitness cost associated with resistance, and 1 indicating an equivalent fitness cost as B resistance. Grey regions represent parameter combinations where the resistance threshold is not crossed within 50 years even in the absence of a test. Results are shown assuming perfect test sensitivity and specificity.



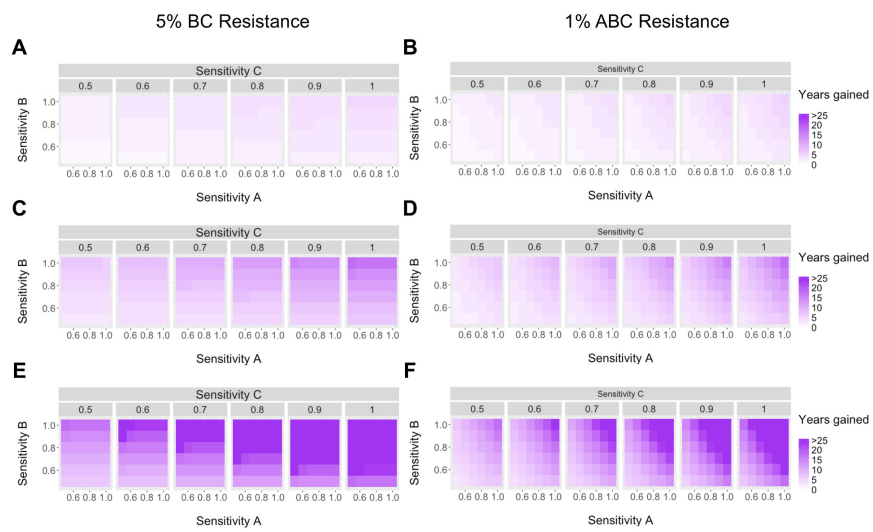
**Figure S4. Impact of varying strain fitness on delays to resistance establishment with higher POC test coverage.** Additional years for (A,C) BC resistant strains to represent 5% or (B,D) ABC resistant strains to represent 1% of prevalent strains, when a POC test determining resistance to all three antibiotics was used for (A,B) 25% or (C,D) 50% of identified cases. Additional cases gained were calculated relative to no test use in the population. Detected cases are treated with combination BC therapy in the absence of a POC test. Fitness costs associated with resistance to antibiotic B are shown along the top panel. Fitness costs associated with resistance to antibiotics A and C are calculated as relative fitness costs, as described in Methods, with 0 representing no fitness cost associated with resistance, and 1 indicating an equivalent fitness cost as B resistance. Grey regions represent parameter combinations where the resistance threshold is not crossed within 50 years even in the absence of a test. Results are shown assuming perfect test sensitivity and specificity. Similar findings were observed for the single resistance POC test.



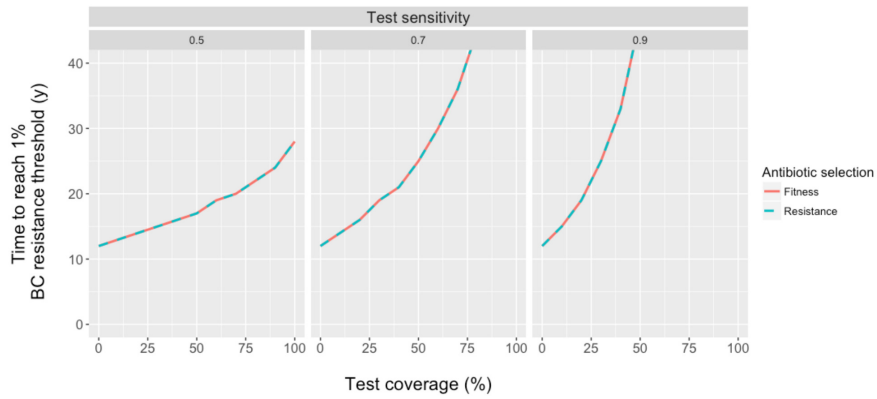
**Figure S5. Impact of probability of resistance emergence on treatment on delays to resistance establishment with a point-of-care test.** (A,C) Additional years for BC resistant strains to represent 5% of prevalent strains. (B,D) Additional years for ABC resistant strains to represent 1% of prevalent strains. A POC test determining resistance to (A,B) antibiotic A only, or (C,D) all three antibiotics was used for 10% of identified cases, with additional years gained calculated relative to no test use in the population. Detected cases are treated with combination BC therapy in the absence of a POC test. Probabilities of resistance emergence during treatment were varied for each antibiotic. Results are shown assuming perfect test sensitivity and specificity.



**Figure S6. Impact of varying strain sensitivity and specificity on delays to resistance establishment with a point-of-care test.** (A,C) Additional years for BC resistant strains to represent 5% of prevalent cases. (B,D) Additional years for ABC resistant strains to represent 1% of prevalent cases. A POC test determining resistance to (A,B) antibiotic A only, or (C,D) all three antibiotics was used for 10% of identified cases, with additional years gained calculated relative to no test use in the population. Detected cases are treated with combination BC therapy in the absence of a POC test. Sensitivity and specificity values represent test properties for detecting resistance to each antibiotic independently, as described in Methods.

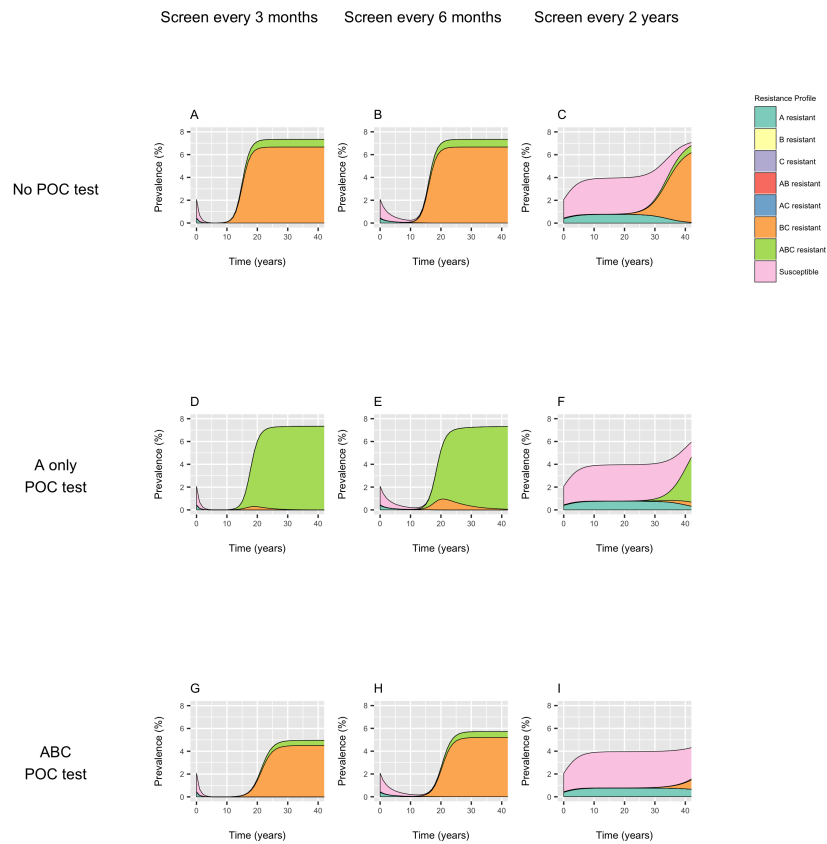


**Figure S7.** Impact of different test sensitivities for determining resistance to each of the three antibiotics included in the POC test. Test sensitivity for determining resistance to each antibiotic was varied from 50 to 100%. Additional years for (A,C, E) BC resistant strains to represent 5% or (B,D, F) ABC resistant strains to represent 1% of prevalent strains was calculated relative to no test use in the population. Results are presented assuming (A,B) 10%, (C,D) 25%, and (E,F) 50% test coverage. Detected cases are treated with combination BC therapy in the absence of a POC test.



**Figure S8. Effect of antibiotic selection strategy on POC test impact.** When an infection was identified as susceptible to more than one antibiotic using the POC test for ABC resistance, treatment choice was based on either fitness cost (fitness) or probability of resistance acquisition on treatment (resistance). Results are shown for time until BC resistant isolates to represent greater than 1% of prevalent cases, with different test coverage and test sensitivity. Results are similar for time to ABC resistance.





**Figure S9. Effect of alternate screening intensities on POC test impact.** Population prevalence and prevalence of different strains is shown for: no POC test (top row), POC test for antibiotic A only used in 10% of cases tested (middle row), POC test for all three antibiotics used in 10% of cases tested (bottom row). The screening frequency was changed from annual (in the main analysis) to every 3 months (first column), every 6 months (second column), or every 2 years (third column). When an infection was identified as susceptible to more than one antibiotic using the POC test for ABC resistance, treatment choice was based on fitness cost. Cases not tested with the POC test were treated in combination with antibiotics B and C.

**Table S1.** Antibiotic choice based on infecting strain resistance properties and testing strategy.

POC test	Infecting strain resistance profile								
	Not ascertained	Susceptible	A	B	C	AB	AC	BC	ABC
None	BC	BC	BC	BC	BC	BC	BC	BC	BC
A only	BC	A	BC	A	A	BC	BC	A	BC
ABC	BC	BC	B(C*)	C	B	C	B	A	Alternate treatment

\*For the ABC-resistance test, the base case assumed that with  $> 1$  antibiotic choice available, the antibiotic with the highest fitness cost associated with resistance was selected. We also considered an antibiotic selection strategy based on probability of resistance emergence on treatment. The only difference under this strategy was that A only resistant strains would be treated with antibiotic C instead of B.