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### Original Research

## Electrocardiogram Testing During Athletic Preparticipation Physical Examinations

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### Abstract

**Context:** Sudden cardiac death (SCD) is a relatively rare yet unfortunate risk of athletic participation. To reduce the incidence of SCD, electrocardiogram (ECG) use during athletic preparticipation examinations (PPEs) has been proposed to detect underlying cardiac abnormalities.

**Objective:** To estimate the effectiveness of ECG use during athletic PPEs.

**Design:** Epidemiologic modeling.

**Populations:** Public high school athletes.

**Data Collection and Analysis:** Estimates of ECG sensitivity (70%) and specificity (84%) were drawn from the literature, as was the estimate of overall prevalence of cardiac conditions relevant to SCD (0.3%). Participation rate by sex was determined from National Federation of State High School Associations data. Participation by ethnicity was assumed to be proportionate to the public high school attendance rates for grades 9 through 12 (18.4% African American). Population-specific ECG effectiveness (positive predictive value), estimated total costs, cost per year of life saved, and cost to identify 1 additional case were computed. Total annual PPE screening costs reflected a cardiologist's office visit, including echocardiogram for those athletes with a positive ECG screen.

**Results:** The model predicted that 16% of all athletes would be expected to have a positive ECG, but only 1.3% of athletes with a positive ECG would have a cardiac abnormality capable of causing SCD, including hypertrophic cardiomyopathy, structural defects, and various conduction abnormalities. Total annual cost estimates for ECG screening and follow-up exceeded \$126 million. Average cost per year of life saved across groups was \$2693, and the cost to identify 1 additional case averaged \$100827. Compared with females, males had both lower cost per year of life saved and lower cost to identify 1 true case. Similarly, black males exhibited lower costs than white males. Across groups, false-positive ECG screening exams accounted for 98.8% of follow-up costs.

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**Conclusions:** Large-scale, mass ECG testing would be a costly method to identify athletes with cardiac abnormalities. Targeting high-risk populations can increase the effectiveness of the ECG for athletic PPE screening.

**Keywords:** [cardiac abnormalities](#), [sudden cardiac death](#), [prevalence](#)

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