# Behavioral Impact of Community Based Cardiovascular Screening

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## Abstract

**Introduction:** There is a significant burden of chronic disease related to lifestyle factors, such as poor diet and physical inactivity. Preventive community-based health screenings have been shown to improve health behaviors.

**Methods:** Participants self-selected to receive cardiovascular screening services provided by Life Line Screening, LLC in 2015. In total, 3,267 screening participants were surveyed and utilized for this analysis. Following their initial screening, subjects were contacted to complete a follow-up survey which assessed their behavior modifications. These results were compared to a control group, comprised of 608 screening-naïve individuals contacted in 2016.

**Results:** Survey results demonstrated a statistically significant difference between screened and unscreened individuals for all follow-up survey questions related to behavioral modifications (e.g. eating healthier foods, increasing exercises, etc.) The follow-up survey comparison of participants with "normal" cardiovascular screening results, versus participants with "abnormal" or "critical" screening results did not generally differ.

**Conclusions:** Regardless of cardiovascular screening results (i.e. normal, abnormal, or critical), participants generally took action to modify their lifestyle; however, participants with abnormal and critical findings were more likely to report taking all of their medicines as prescribed by their doctor. Furthermore, screening participants were more likely to report making healthy behavior modifications compared to screening-naïve individuals.

**Keywords:** Cardiovascular; Screening; Lifestyle; Behavior

## Introduction

There is a significant burden of chronic disease related to lifestyle factors such as poor diet and physical inactivity. An estimated 20% of deaths in the U.S. can be contributed to these lifestyle factors. Positive behavioral health changes can be made in order to reduce the incidence of chronic disease [1]. Preventive screenings have been shown to improve health behaviors through early detection of disease or risk factors for disease. Specifically, screenings can influence smoking habits, diet, exercise, alcohol consumption and overall healthy living [2].

Cardiovascular screening has come under scrutiny as it has been postulated that screening only attracts the "worried well" and may alarm healthy individuals into undergoing unnecessary tests. This manuscript reviews the results of a follow-up survey of individuals who underwent community-based cardiovascular screening to assess whether screening modified behavior, regardless of the screening results.

Specifically, this survey evaluated the participants' motivation to take action to modify their lifestyle, including altering their diet, exercising more, reducing stress, and other changes. The analysis presented in this manuscript compares follow-up survey results of screened participants to a survey of screening-naïve individuals to assess whether screening generally results in modification of behavior. Additionally, we examined whether individuals with abnormal results (e.g. screening identified cardiovascular disease) were more likely to modify their behavior in comparison to participants with normal results.

## Methods

### Population

Screening participants self-selected to receive screening services provided by Life Line Screening, LLC (LLS). LLS promotes their screening offerings via direct mail marketing, email and television advertisements and participants self-pay for the services. All of the screening participants underwent screening between September 2015 and November 2015. Participants for the survey were chosen at random from this range of dates and represent a range of geographical locations. 94,755 participants were then surveyed via e-mail using an IRB approved survey instrument between October 29, 2015 and January 12, 2016. Overall, 3,267 screening participants completed the survey and were utilized for this analysis (response rate 3.4%).

The screening-naïve group (control group) was comprised of 608 individuals who had never participated in a LLS or other community-based, cardiovascular screening program. 6,589 individuals were contacted via email between March 30, 2016 and March 31, 2016.

Individuals selected to receive the survey were individuals who had signed up for LLS services but had not yet undergone screening; similar to the screened-group, these participants represent a random geographical samples. A total of 38 individuals responded to the survey (response rate 11.2%) and 608 individuals were eligible for the analysis.

## Screening variables

LLS offers a range of cardiovascular and health outcome screening services including carotid duplex ultrasound for the assessment of carotid artery stenosis (CAS), as determined by peak systolic velocity (PSV) and the presence of plaque, abdominal ultrasound for the assessment of abdominal aortic aneurysm (AAA), the assessment of peripheral artery disease (PAD), as determined by ankle-brachial index, and electrocardiogram for the assessment of atrial fibrillation (AFib).

LLS has defined CAS as normal (PSV <110 cm/s, no apparent plaque), mild/moderate (<110 cm/s, with plaque), moderate (110-139 cm/s, caused by plaque), significant (140 cm/s or greater, including occlusion), and critical (PSV ≥ 300 cm/s and/or trickle flow and/or unstable plaque). For this analysis, any finding of "mild/moderate," "moderate" or "significant" is reported as "abnormal." A normal finding of AAA is defined as <3 cm with an abnormal finding of ≥ 3 cm. A critical finding of AAA is defined as >5 cm. Lastly, an abnormal finding of PAD is defined as an ABI<0.9. Critical findings of PAD are strictly related to systolic brachial pressure suggesting hypertension with a value of ≥ 180 mmHg.

Screening services also include a range of blood tests including those that evaluated: lipids, triglycerides, liver transaminases (AST/ALT), thyroid stimulating hormone, high-sensitivity C-reactive protein, glucose, hemoglobin A1c, and others. Lastly, at screening, subjects also completed a questionnaire and provided self-reports of their demographics (i.e., age, gender) as well as information on smoking status, history of statin use, history of stroke, and prior diagnoses of COPD, atrial fibrillation, hypertension, high cholesterol or diabetes.

## Follow-up survey

Screened subjects were contacted by LLS following their initial screening for the follow-up survey. Subjects were contacted by e-mail and surveyed to learn about their actions following screening including visitations with healthcare providers and behavior modifications.

Questions asked included:

- How would you rate your current overall health?
- Since receiving the results of your health screening tests from Life Line Screening, have you shared the results with a doctor or health care provider?
- Did your experience with Life Line Screening have any influence on your decision to see a doctor or health care provider?

Have you taken any of the following actions as a result of the screening?

Eating more healthy foods overall?

Lose weight or keep weight at healthy level?

Reduce alcohol consumption from an unhealthy level to a moderate one?

Reduce or stop smoking?

Exercise more?

Steps to reduce stress?

Reading more about health or pay closer attention to your health?

Start taking new vitamins or supplements?

Making sure I take all medicines as prescribed by my doctor?

Had more preventive screenings done?

Control group subjects were contacted between March 30, 2016 and March 31, 2016 via e-mail. As noted, the control group included individuals who had self-selected to participate in LLS screening services, but had not yet been screened. Questions asked included demographic information, medical information (e.g. presence of diabetes, etc.) and questions to assess their current behavior which may impact health outcomes including:

- How would you rate your current overall health?
- In the last several months, have you made any changes in your lifestyle to be healthier?
- If yes, did you?

Consult with a doctor about preventive health care?

Take new prescriptions as prescribed by a doctor?

Keep alcohol consumption at a moderate level?

Exercise more?

Eat healthy foods overall?

Make sure you take all medicines as prescribed by your doctor?

Take vitamins or supplements?

Take steps to reduce stress?

Keep weight at a healthy level?

Read about health or pay close attention to your health?

Within the last few months, have you attempted to quit smoking or reduce your level of smoking? (Question only answered by individuals who responded that they are current smokers).

When analyzing the survey results, individuals in the control group who did not provide a response and responded "do not recall" were considered "no" responses in the final statistical analysis.

## Results

The population of screened participants was generally over the age of 50 (97%), included more women than men (62%), and was disproportionally Caucasian (88%). This sample is an accurate representation of individuals screened by LLS. As reviewed previously [3], despite the imbalances of this population, the overall size of the screened population (over 8 million screened completed), allows for extrapolation to the American population as a whole [3]. Similarly, the control group was represented by a larger female population (69%) and the majority of participants were over the age of 50 years (95%). While both groups are disproportionately Caucasian, 4% of the screened population was African American, and 4% was Native American. On the other hand, 4% of the control population was Hispanic. An overview of the screened and control populations is provided in (Table 1).

The screened participants were stratified as 'normal,' 'abnormal,' and 'critical' based on the results of their screening tests for CAS, AAA, PAD, and AFib. Of the 3,267 screened participants surveyed, there were 1,915 participants with one or more "abnormal" result (58.7%), 43 participants with one or more "critical" result (1.3%) and the remaining participants had "normal" screening results (1,309 participants, 40%).

Of the screened individuals, 1,854 had an abnormal CAS finding and 11 had a critical CAS finding. 39 individuals had an abnormal AFib finding and 8 had a critical finding. For PAD, 273 and 22 individuals had abnormal and critical findings, respectively. Lastly, 26 individuals had an abnormal AAA result and 3 had a critical finding.

Ultimately, the highest rate of abnormal screening results was reported for CAS (56.75% of the whole population; 96.81% of abnormal results), while the highest rate of critical screening results was for PAD (.67% of the whole population; 51.16% of critical findings). However, as noted above, the critical findings for PAD are related only to the presence of hypertension (systolic brachial pressure greater or equal to 180 mmHg) as such these findings do not imply a severity of PAD but the potential presence of a hypertension, a risk factor for cardiovascular disease.

The fewest abnormal (0.80% of the whole population; 1.36% of abnormal results) and critical (0.09% of the whole population; 6.98% of critical findings) screening results were reported for AAA.

All subjects were asked to rate their current overall health based on a scale of poor, fair, good, very good, or excellent. Interestingly, abnormal, critical, normal and control participants perceived the status of their health similarly. For example, 90.28% (n=1,729) of abnormal, 86.05% (n=37) of critical, 92.74% (n=1,214) of normal, and 82.24% (n=500) of control participants considered their health to be 'good' or better (Table 2) presents participants' perceived health status, categorized by abnormal, critical, normal and control participants.

Additionally, screened participants were asked about lifestyle changes following screening ("Have you taken any of the following actions (eating healthy, losing weight, etc.) as a result of the screening?"). The screening-naïve/control group was asked, "In the last several months, have you made any changes in your lifestyle to be healthier?" 297 of the 608 control subjects (49%) said, yes, they had made lifestyle changes. These 297 subjects were then asked about changes to specific behaviors (e.g. eating healthier foods, keeping weight at a healthy level, etc.)

| Total | Screened Population | Control Population |
|---|---|---|
|  | 3,267 n (%) | 608 n (%) |
| **Gender** | | |
| Male | 1207 (37) | 190 (31) |
| Female | 2038 (62) | 418 (69) |
| N/A | 22 (1) | 0 (0) |
| **Age Group** | | |
| 50-54 | 271 (8) | 80 (13) |
| 55-59 | 383 (12) | 129 (21) |
| 60-64 | 670 (21) | 127 (21) |
| 65-69 | 679 (21) | 134 (22) |
| 70-74 | 537 (16) | 68 (11) |
| 75-79 | 370 (11) | 26 (4) |
| 80-84 | 179 (5) | 11 (2) |
| 85+ | 64 (2) | 3 (1) |
| Under 50 | 114 (4) | 30 (5) |
| **Race** | | |
| African American | 135 (4) | 16 (3) |
| Asian | 19 (1) | 6 (1) |
| Caucasian | 2887 (88) | 552 (91) |
| Hispanic | 83 (2) | 24 (4) |
| Native American | 131 (4) | 2 (0) |
| Other | 12 (1) | 8 (1) |

**Table 1:** Population overview.

| Group | Answer | | | | |
|---|---|---|---|---|---|
|  | Poor n (%) | Fair n (%) | Good n (%) | Very Good n (%) | Excellent n (%) |
| Total Screened N=3267 | 19 (0.6) | 268 (8.2) | 1327 (40.6) | 1,302 (39.9) | 351 (10.7) |
| Abnormal | 14 | 172 | 822 | 749 | 158 |
| Critical | 0 | 6 | 21 | 13 | 3 |
| Normal | 5 | 90 | 484 | 540 | 190 |
| Control N=608 | 8 (1.3) | 100 (16.4) | 260 (42.8) | 187 (30.8) | 53 (8.7) |

**Table 2:** Survey results: How would you rate your current overall health?

Results of these questions revealed that screened individuals were more likely to make healthy lifestyle changes, compared to screening-naïve individuals for the ten behavior modification-related questions. For instance, 61% (n=2,005) of screened subjects and 46% (n=279) of control participants reported eating healthier foods. 55% (n=1,807) of screened subjects and 32% (n=196) of control participants reported losing weight or keeping weight at a healthy level. 49% (n=1,588) of screened subjects and 39% (n=238) of control participants reported

exercising more. Complete results of all behavior modification-related survey questions are shown by screened (broken down by abnormal, critical and normal results) and control in (Table 3).

| Question | Group | Answer | | | |
|---|---|---|---|---|---|
| | | Yes [n (%)] | No [n (%)] | Don't Recall [n (%)] | Blank [n (%)] |
| Eating more healthy foods overall | Screened N=3267 | 2005 (61) | 1135 (35) | 28 (1) | 99 (3) |
| | Abnormal | 1172 | 670 | 15 | 58 |
| | Critical | 24 | 15 | 1 | 3 |
| | Normal | 809 | 450 | 12 | 38 |
| | Control N=608 | 279 (46) | 326 (54) | 3 (1) | - |
| Lose weight or keep weight at healthy level/keep weight at a healthy level | Screened N=3267 | 1807 (55) | 1309 (40) | 22 (1) | 129 (4) |
| | Abnormal | 1045 | 784 | 14 | 72 |
| | Critical | 29 | 13 | 0 | 1 |
| | Normal | 733 | 512 | 8 | 56 |
| | Control N=608 | 196 (32) | 402 (66) | 10 (2) | - |
| Reduce alcohol consumption from an unhealthy level to moderate one/keep alcohol consumption at a moderate level? | Screened N=3267 | 769 (24) | 1973 (60) | 91 (3) | 434 (13) |
| | Abnormal | 461 | 1154 | 56 | 244 |
| | Critical | 11 | 27 | 0 | 5 |
| | Normal | 297 | 792 | 35 | 185 |
| | Control N=608 | 281 (46) | 322 (53) | 5 (1) | - |
| Reduce or stop smoking | Screened N=3267 | 589 (18) | 1947 (60) | 122 (4) | 609 (18) |
| | Abnormal | 339 | 1142 | 77 | 357 |
| | Critical | 11 | 23 | 1 | 8 |
| | Normal | 239 | 782 | 44 | 244 |
| | Control N=38[*] | 21 (55) | 17 (45) | 0 (0) | - |
| Exercise more | Screened N=3267 | 1588 (49) | 1533 (47) | 16 (0) | 130 (4) |
| | Abnormal | 935 | 906 | 6 | 68 |
| | Critical | 23 | 18 | 1 | 1 |
| | Normal | 630 | 609 | 9 | 61 |
| | Control N=608 | 238 (39) | 365 (60) | 5 (1) | - |
| Steps to reduce stress/take steps to reduce stress | Screened N=3267 | 1311 (40) | 1701 (52) | 44 (1) | 211 (7) |
| | Abnormal | 758 | 1005 | 27 | 125 |
| | Critical | 23 | 17 | 1 | 2 |
| | Normal | 530 | 679 | 16 | 84 |
| | Control N=608 | 215 (35) | 383 (63) | 10 (2) | - |
| Reading more about health or pay closer attention to your health/read about health or pay close attention to your health | Screened N=3267 | 1967 (60) | 1152 (35) | 22 (1) | 126 (4) |
| | Abnormal | 1147 | 692 | 10 | 66 |

|  |  |  |  |  |  |
|---|---|---|---|---|---|
|  | Critical | 33 | 8 | 1 | 1 |
|  | Normal | 787 | 452 | 11 | 59 |
|  | Control N=608 | 265 (44) | 340 (56) | 3 (0) | - |
| Start taking new vitamins or supplements/take vitamins or supplements | Screened N=3267 | 973 (30) | 2123 (65) | 24 (1) | 147 (4) |
|  | Abnormal | 567 | 1253 | 16 | 79 |
|  | Critical | 15 | 25 | 1 | 2 |
|  | Normal | 391 | 845 | 7 | 66 |
|  | Control N=608 | 260 (43) | 345 (56) | 3 (1) | - |
| Making sure I take all medicines as prescribed by my doctor/make sure you take all medicines as prescribed by your doctor | Screened N=3267 | 2037 (62) | 999 (31) | 41 (1) | 190 (6) |
|  | Abnormal | 1264 | 534 | 16 | 101 |
|  | Critical | 31 | 8 | 1 | 3 |
|  | Normal | 742 | 457 | 24 | 86 |
|  | Control N=608 | 264 (43) | 337 (55) | 7 (1) | - |
| Had more preventive screenings done/consult with a doctor about preventive health care | Screened N=3267 | 669 (20) | 2412 (74) | 21 (1) | 165 (5) |
|  | Abnormal | 389 | 1424 | 12 | 90 |
|  | Critical | 14 | 28 | 0 | 1 |
|  | Normal | 266 | 960 | 9 | 74 |
|  | Control N=608 | 184 (30) | 417 (69) | 7 (1) | - |

*Control subjects only responded to this question if they had responded that they were current smokers

**Table 3:** Survey results: Behavior modification questions.

## Statistical analysis

Two chi-square tests were performed for the ten survey questions regarding behavioral modification (e.g. eating healthier foods, reducing stress, etc.) The first test compared all subjects who underwent screening, to the control subjects to determine whether screened individuals were more likely to modify their health compared to unscreened individuals. Overall, the results showed a statistically significant difference between screened and unscreened individuals for all ten questions, with screened individuals more likely to modify their behavior.

The second test compared the results of screened individuals who had normal results to screened individuals who had abnormal and critical results, to identify whether individuals with abnormal/critical test results were more likely to modify their health. Generally, the results did not demonstrate a significant difference between normal and abnormal individuals, with the exception of "Making sure I take all medicines as prescribed by my doctor." Individuals who were screened and found to have abnormal or critical findings were statistically more likely to report that they were taking their medications as prescribed than individuals who were screened and had normal results (Table 4).

| Survey Question | P-value | |
|---|---|---|
|  | **Screened *vs.* Control** | **Normal *vs.* Abnormal* (Screened)** |
| Eating healthier | <0.0001 | 0.68 |
| Lose weight or keep weight at healthy level/keep weight at a healthy level | <0.0001 | 0.52 |
| Reduce alcohol consumption from an unhealthy level to a moderate one/keep alcohol consumption at a moderate level | <0.0001 | 0.35 |
| Reduce or stop smoking/within the last few months, have you attempted to quit smoking or reduce your level of smoking? | <0.0001 | 0.78 |
| Exercise more | <0.0001 | 0.65 |

| | | |
|---|---|---|
| Steps to reduce stress/take steps to reduce stress | 0.03 | 0.73 |
| Reading more about health or pay closer attention to your health/read about health or pay close attention to your health | <0.0001 | 0.93 |
| Start taking new vitamins or supplements/take vitamins or supplements | <0.0001 | 0.93 |
| Making sure I take all medicines as prescribed by my doctor/make sure you take all medicines as prescribed by your doctor | <0.0001 | <0.0001 |
| Had more preventive screenings done/consult with a doctor about preventive health care | <0.0001 | 0.86 |
| *Abnormal consists of individuals with abnormal and critical screening results. | | |

**Table 4:** Chi square results.

Demonstrate that screened subjects were more likely to report behavioral modifications than unscreened individuals. Subjects with normal screening results were generally not more inclined to make changes compared to subjects who received abnormal or critical screening findings.

## Discussion

Regardless of cardiovascular screening results, LLS participants self-reported that they generally took action to modify their lifestyle. While all screening participants reported an increase in behavioral modifications, participants with abnormal and critical findings were more likely to report taking all of their medicines as prescribed by their doctor. Importantly, subjects who underwent cardiovascular screening were significantly more likely to report healthy behavioral modifications, compared to non-screened individuals.

Study findings that abnormal and critical participants were more likely to take all of their medicine, corresponds with the well-known Health Belief Model, which was developed to help predict health-related behaviors, specifically those related to the uptake of health services. The Health Belief Model proposes that individuals who perceive a given health problem as serious are more likely to engage in behaviors to prevent the health problem from occurring, or to reduce its severity [4]. Assessed the impact of medical management updates and long-term support on the health behaviors of individuals with hereditary cancer [5]. During this investigation, participants completed questionnaires six months before and after a one-day, educational retreat. Questionnaires focused on lifestyle, cancer screening and prevention activities. Of the participants who completed both the pre- and post-retreat questionnaire, about one half reported making lifestyle changes and almost two-thirds increased cancer screening practices, initiated chemoprevention and planned future preventative interventions, as a result of their retreat experience.

Similarly, a review of randomized controlled trials comparing the influence of screening on health behaviors between a screened group and unscreened group found that risk factor screenings correlate with a positive effect on health behavior [2]. Another study, which sought to determine whether negative screening results leads to poorer health practices reported that screening participants were more likely to rank eating fruit and exercise as important after their screening, compared to before their screening. Overall, authors concluded that in the short-term, negative screening results don't lead to less healthy behaviors, in fact results suggest that screenings can be used to promote positive behavioral changes [6]. Marteu et al. also concluded that intervention programs aimed at reducing the risk of cardiovascular disease generally don't lead to raised concerns about health [7].

Adherence to statin therapy has also been investigated with respect to the beneficial changes in behavior, specifically weight loss, in patients who underwent coronary artery calcium (CAC) scoring with cardiac computed tomography. Patients who had undergone baseline CAC testing and had returned for a follow-up scan were weight documented and administered questionnaires related to compliance. The analysis of statin compliance considered 2608 individuals, and the analysis for weight loss included 1078 individuals, who were followed for 4.1 ± 3.2 years after an initial CAC scan. Results showed that statin compliance was lowest among individuals with CAC=0, and increased with higher CAC scores. Behavioral modification resulting in weight loss was also lowest among individuals with CAC=0 and gradually increased with higher CAC scores. In conclusion, this investigation demonstrated increased statin adherence among patients with higher CAC scores and increased adherence to lifestyle modifications [8].

In contrast to our study findings, other investigations have found that negative screening results actuate negative behaviors. For example, Wermer et al. aimed to assess the long-term psychological impact of screening for intracranial aneurysms (IAs) in individuals with relatives with IAs. Researchers found that screening for IA can be associated with negative psychosocial effects in some individuals, including reduced work, changes in self-esteem or personal relationships [9] also found that testing positive for HPV was associated with adverse social and psychological outcomes. Likewise, some literature supports the "certificate of health effect," which suggests that individuals who have received negative screening results may be resistant to advice on healthy lifestyles [10].

Numerous investigations have reported on the health benefits of behavioral modifications such as increased physical activity, eating healthy and reducing stress [11]. Warburton et al. proposes that regular physical activity contributes to both the primary and secondary prevention of chronic disease, including cardiovascular disease, type 2 diabetes, and cancer [12]. "Van Duyn and Pivonka recommends that increasing consumption of fruits and vegetables can help maximize health and lead to a reduction in disease risk". Stress reduction and the related health benefits have also been examined. One meta-analysis suggests that stress alleviation methods, such as mindfulness-based stress reduction (a group program that uses meditation), can comfort individuals with clinical and nonclinical problems [13].

A growing body of evidence supports that increased patient activation/patient engagement (i.e. an individual's readiness to take

independent actions to manage their health) is associated with better health outcomes overall. This evidence suggests that activated people are more likely to engage in healthy behaviors such as eating healthy and exercising regularly, and more inclined to avoid unhealthy behaviors, such as smoking. Additionally, patients with higher activation tend to have typical, healthy biometrics (e.g. body mass index, blood pressure, cholesterol). Notably, studies have shown that certain interventions can effectively increase patient activation [14]. LLS community-based cardiovascular screening results provide further support that interventions can increase patient activation, and therefore healthy behaviors. However, additional follow-up is necessary to confirm that the reported health behaviors do in fact lead to long-term positive health outcomes for screening participants [15].

Additionally, regardless of their screening outcomes, most screened participants felt they have made the right decision having the screening performed. Specifically, 95% of critical participants, 88% of abnormal participants and 90% of normal screening participants reported they had made the right decision to have cardiovascular screening. Furthermore, after receiving their screening results, the majority of participants reported feeling more knowledgeable about the status of their health and more determined to stay healthy moving forward.

With respect to limitations, because participants were self-referred to screenings, the analysis was subject to selection bias of an uncertain nature and extent. Incomplete records are also a potential source of bias; some participants did not complete every answer in the survey. Additionally, the control group was relatively small (n=608). Future studies are warranted to examine how survey responses translate into long term behaviors and improved health outcomes. Additional study may also be necessary to rule out response/nonresponse biases.

## Conclusion

Community-based cardiovascular screenings can be an effective catalyst for healthy behavioral changes, including exercise, eating healthy foods, and making sure to take all medicines as prescribed by your doctor. This analysis has demonstrated that screened participants experienced an increased motivation to make healthy life changes, regardless of the screening outcomes, following their screening service. Overall, this investigation provides evidence supporting the importance of cardiovascular screening services for empowering participants to make meaningful behavioral changes. Further studies are required to demonstrate a direct association with improved health outcomes.

## Compliance with Ethical Standards

**Disclosure of potential conflicts of interest:** Steven Weisman is an independent scientific consultant that assists Life Line Screening, LLC in its research efforts. Andrew Manganaro, Joelle Reizes, Nathalie Garbani and Sara Zywicki are employees of Life Line Screening, LLC.

**Ethical approval:** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed consent:** Informed consent was obtained from all individual participants included in the study.

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