

## Interventions to Improve the Uptake of Screening Across a Range of Conditions in Ethnic Minority Groups: A Systematic Review

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# Interventions to Improve the Uptake of Screening Across a Range of Conditions in Ethnic Minority Groups: A Systematic Review

## Abstract

**Background:** Screening programs are well established in cancer, and are now being implemented in other conditions. An effective screening programme leads to early disease detection and improved outcomes its impact is dependent on the quality of the test and the proportion of the target population participating. A further consideration is that uptake of screening by minority groups is low.

**Purpose:** To determine which interventions have successfully increased screening uptake amongst minorities.

**Data Sources:** Medline, Cochrane database and the grey literature were searched from 1990 to 1<sup>st</sup> March 2016.

**Study Selection:** 55 English language studies that assessed uptake of screening in any minority population in the country of study over 18 years and that included a comparison arm

**Data Extraction:** Independent data extraction was undertaken by two researchers (CK and MP) using a pre-designed data extraction form (DEF) which assisted retrieval of the core contents of each study and the organization of material.

**Data Synthesis:** Evidence was organized by screening test and type of intervention. Two authors (CK and MP) extracted data into evidence tables to enable comparison of study characteristics and findings. The heterogeneity of methods precluded a meta-analysis thus results are descriptive. Evidence was also assessed using the Cochrane Collaboration risk of bias tables.

**Results:** This review explores data from international studies on a variety of minority groups, interventions and screening programs providing a narrative review of their success and limitations.

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**Review Criteria:** A broad database (PubMed® and Cochrane); grey literature and free text internet searches was performed by two authors (CK and MP) to identify potentially relevant articles. These were then reviewed independently by these two authors against our inclusion and exclusion criteria. Relevant articles were obtained and data extracted into our pre-designed data extraction tables for analysis. Papers were grouped and analyzed by condition screened-for as well as by ethnicity.

**Message for the clinic:** Screening is an important and developing area of medical practice. However, there are groups within the population where screening uptake is low. Multiple strategies to improve screening uptake have been trialed with variable success. It seems key that a tailored approach is used for each population taking into account local and cultural factors.

## Introduction

Health screening and reduction in health inequalities are national and international priorities<sup>[1, 2]</sup>. Screening identifies asymptomatic people, providing earlier diagnosis, better health outcomes<sup>[3-8]</sup> and decreases mortality<sup>[4, 9]</sup>. Screening tests are introduced based on analysis of the effectiveness, cost and acceptability of the program<sup>[10-12]</sup>. Significant proportions of the population must participate to observe improvements in outcome<sup>[13]</sup> with uptake being the most important factor in determining a program's success<sup>[14-16]</sup>.

Screening programs in adults are mainly cancer-related<sup>[17]</sup>. Many programs actively promote screening, utilizing resources to facilitate uptake and often offering free screening<sup>[12]</sup>. Despite this, uptake often remains suboptimal, mirroring health service uptake in general with pockets of the population showing poor coverage<sup>[18]</sup>. At the same time, there is recognition of the importance of cultural, social and economic factors on health and health behaviours. Arguably, these requirements are more important in screening where there is a lack of driver to seek health care as the population targeted is asymptomatic.

Minority groups generally have a lower uptake of screening. Across screening programs there are identified barriers<sup>[19]</sup>: logistical; emotional and cultural. Black and minority ethnic groups (BME) are more likely to have a poorer experience of care<sup>[20]</sup> as well as lower attendance at various screening programs<sup>[21, 22]</sup> in both the UK<sup>[23, 24]</sup> and USA<sup>[25-27]</sup>.

Attempts to improve uptake have been made by instituting various interventions, often based on single screening modalities or single populations<sup>[28-30]</sup>.

In this systematic review we review interventions to improve screening uptake across minority groups and provide a narrative review of their evidence base.

## Methods

Our approach follows that set out in Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA).

### **Data Sources and Searches**

A comprehensive identification of the literature, by scoping a range of evidence from diverse sources was followed by broad searches across international academic databases (PubMed® and Cochrane); grey literature and free text internet searches.

The key search terms used were minority, mass screening, education, intervention and community (see appendix 1). The search was broad to capture relevant papers, an attempt to narrow our parameters in a scoping review missed key papers.

### **Study Selection**

Evidence was sourced and retrieved by two members of the research team (CK and MP). Results were stored electronically and duplicate items removed. Initially titles and abstracts were screened to identify potentially relevant papers (table 1). Thereafter, abstracts were reviewed against inclusion and exclusion criteria (table 2). At all stages any discrepancy on

inclusion of studies was discussed until agreement achieved. Figure 1 outlines this search process.

### **Data extraction and Quality Assessment**

Independent data extraction was undertaken by two researchers (CK and MP) using a pre-designed data extraction form (DEF) to assist retrieval of the results of each study and the organization of material.

We did not exclude articles based on quality, however, significant quality and methodological issues are highlighted within our results and risk of bias tables associated with each article.

### **Data Synthesis and Analysis**

**Stage 1.** Papers were reviewed by two members of the research team (CK and MP). Evidence was organized by screening test.

**Stage 2.** Two authors (CK and MP) extracted data into evidence tables, organized by condition screened for and ethnicity. Tabularization (table 3) of findings enabled comparison of study characteristics.

Evidence was further assessed using the Cochrane Collaboration risk of bias tables (supplementary material).

### Results

Fifty-five papers form this review. A meta-analysis was not possible due to the heterogeneity of the data. The results are presented grouped by condition. Table 3 summarizes the key findings for each study.

#### Colon Cancer Screening (CRCS)

There were 22 studies on CRCS, examining either fecal occult blood (FOB) or endoscopic testing.

#### African American(n=9)

Many studies (n=6) utilized patient navigators. A comparison (n=456) of the effectiveness of telephone navigation to direct mail (control) resulted in a relative risk of 4.4, however, only 27% of intervention-group screened<sup>[31]</sup>. A comparison (n=764) of mailed information and test kits alone to adding tailored navigation<sup>[32]</sup>. Navigation led to significant ( $p=0.001$ ) increases in screening (38%) compared to standard (23.7%). A further RCT (n=2593) randomized to education only (control) or education plus navigation<sup>[33]</sup>. However, many participants (81%) were already up-to-date at baseline, limiting the power. Of those non-compliant, more intervention (72.5%) than control (58.6%) screened ( $p=0.008$ ). A comparison of (n=240) professional and peer navigation did not find a difference ( $p=0.178$ ), but overall screening levels were high (>70%)<sup>[34]</sup>. The same group carried out another study (n=350) including a usual care group<sup>[35]</sup>. Again, no significant differences were found but overall screening was high (75%). A comparison of information with or without barrier-navigation analysed n=270 patients<sup>[36]</sup>. Screening occurred significantly more in the intervention cohort (27%) than control (13%)  $p=0.020$ .

Overall, navigation seemed successful with four studies showing significant increases in screening. However, in some the overall rate of screening uptake was fairly low. The two non-significant studies showed high levels of screening uptake from baseline nonetheless.

Multi-faceted interventions were trialled in two studies. Firstly, a comparison of group and individual education with tackling financial-barriers<sup>[37]</sup>. A control cohort received leaflets. Uptake of intervention was low (57%), with a per protocol (PP) analysis showing group education resulted in higher screening uptake (33.9%)( $p=0.039$ ) with financial support (22.2%) and individual education (25.4%) non-significant to control (17.7%). However, their inability to meet recruitment and retention targets compromised their results. A comparison (n=106) of a five stage intervention, and compared to one phase (video) and control (non-tailored video)<sup>[38]</sup>. There were significant increases in five stage (63%) and one stage interventions (34%) compared to control (7%) (both  $p<0.0001$ ).

A study (n=316) comparing spiritual to non-spiritual education saw only low rates of screening uptake which were non-significant<sup>[39]</sup>.

Whilst a majority (n=6) of these studies showed significant increases in screening, one had significant retention issues and only 2 had good levels of screening overall (multiphasic intervention and navigation). In contrast, 2 of the 3 non-significant interventions (both utilizing navigators) had high levels of screening.

#### *Vietnamese(n=2)*

A comparison of lay-health-workers delivering education compared to general health advice (n=640) showed significantly more intervention (56%) than control (19%) screened ( $p<0.001$ )<sup>[40]</sup>.

A quasi-experimental study evaluated a public education campaign, using another community as a control<sup>[41]</sup>. However, the communities were not matched and there were difficulties with retention (61%). They report a significant increase in having ever screened endoscopically ( $p<0.05$ ).

Although both these studies showed significant increases in screening to a reasonable rate, the methodological issues limit the ability to draw firm conclusions.

#### *Latino(n=6)*

Three studies utilized navigators and LHWs. A small pilot study (n=21) assessed PN scheduled appointments compared to usual care, with 53.8% of navigated and 13% control screening ( $p=0.085$ )<sup>[42]</sup>. A larger RCT (n=303) also evaluated PN, using printed materials as control<sup>[43]</sup>. The higher uptake of screening in the intervention group (43.7 v 32.1%) was significant ( $p=0.04$ ). Two types of LHW interventions were compared (print v interactive multimedia) with usual care<sup>[44]</sup>. Small increases in the small media, multimedia and control (13.6, 10.2 & 10.8% respectively) were not significant. Overall, only one intervention with navigation in this group was significant.

Two studies used multi-faceted interventions. Firstly, a comparison (n=4540) of multiple interventions to usual care for FOB testing<sup>[45]</sup>. Significantly more intervention than control screened (82.2% v 37.3%  $p<0.01$ ). Secondly, a comparison (n=501) of usual care to mailed test kits and mailed kits plus outreach<sup>[46]</sup>. Screening rates were 2% in usual care; 26% in

mailed kit and 31% in outreach. The difference between each intervention and control was also significant ( $p < 0.001$ ) but between the two active interventions was not ( $p = 0.28$ ).

A different approach utilized the physician as the unit of randomization, where the physician received a reminder letter and the patient education saw significantly more screening in the intervention (56%) than control group (18%) ( $p = 0.002$ )<sup>[47]</sup>

Four of these six interventions showed significant increases in screening uptake, with only one having low levels of uptake. Interestingly, a comparison of two interventions found both significant against usual care but not compared to each other, having potential implications for resource utilization.

#### *Others (n=5)*

Most studies utilized navigators (n=3). Firstly, a comparison of navigation to usual care (n=465) in a mixed ethnicity group found 33.6% of intervention and 20% of control screened ( $p < 0.001$ )<sup>[48]</sup>. A quasi-experimental church based study (n=167) compared navigator-delivered education sessions to control (sessions on general health)<sup>[49]</sup>. Screening in the intervention group increased significantly ( $p < 0.001$ ) from 13.1%-77.4%; control 9.6%-10.8%. The use of culturally tailored education to a non-tailored approach in Native Hawaiians was examined (n=121)<sup>[50]</sup>. They had high baseline levels of screening compliance (64%). Of those who screened on this trial, only 11% screened for the first time. Difference between the two arms was not significant. Whilst two of the three navigator studies showed significant improvements to screening, the results of the third cohort are limited by high-baseline screening rates.

The remaining two studies used multi-faceted interventions, both showing significant increases in screening. The first in Latino and Vietnamese populations (n=1358)<sup>[51]</sup>. They compared a basic intervention (brochure and FOBT) to enhanced (brochure, FOBT and telephone counselling) with usual care. Screening rates increased 4.1% in usual care, 11.9% in basic and 21.4% in enhanced, with both interventions significant over control, and enhanced significant compared with basic (all  $p < 0.01$ ). Small group education, without or without FOBT, was compared to a control group (physical activity) (n=548)<sup>[52]</sup>. Screening occurred in 30%, 25% and 9% of those in intervention with kit, without kit and control respectively (both interventions compared to control  $p < 0.01$ ). The study was not powered to compare the two interventions.

The only study without significant increases in screening had high baseline levels of screening, suggesting the target population was less in need of intervention. Of the 4 significant interventions, only 1 had high levels of uptake overall (church-based education).

#### Breast Cancer Screening

Fourteen studies examined interventions to improve breast cancer screening. The modality assessed was mammography. In addition, some studies utilised clinical breast exam but this was not used as the sole outcome measure in this review.

### *Pakistani/Bangladeshi(n=1)*

An RCT (n=527) examined the effect of a link-worker to usual care<sup>[53]</sup>. There were no differences in screening uptake (49% intervention; 47% control).

### *Vietnamese(n=2)*

Both studies examined the effectiveness of mass media. Firstly, media education alone or with LHW intervention (n=1100)<sup>[54]</sup>. The media alone group became up-to-date from baseline of 74% to 75.6% post intervention (p=0.37) with LHW group increasing from 64.7% to 82.1% (p<0.001). A further study involving mass media (n=788) conducted neighbourhood wide interventions<sup>[55]</sup>. The intervention group had no significant increases in screening uptake post intervention but methodological issues may have influenced their outcomes.

### *Chinese & Korean(n=2)*

A comparison of cultural video, generic video and control (fact sheet) (n=664) showed neither video improved uptake of screening compared with control<sup>[56]</sup>.

A comparison of a spiritual video and education session and control (similar program on healthy diet) (n=428) saw 56% of intervention screened with control 42% (p=0.004)<sup>[57]</sup>.

### *Latinas(n=2)*

Church-based navigator was compared to written information (n=4739)<sup>[58]</sup>. There was no significant increase in screening in either group from baseline.

A comparison of group discussion with and without video (n=400) saw screening increase significantly for each group from baseline (p<0.001) (22% and 18%)<sup>[59]</sup>. The difference was not significant between groups.

### *African American(n=7)*

The majority of interventions (n=4) focused on LHWs. A comparison of LHW interactive computer intervention (n=181) on mammography uptake compared to control (pamphlet)<sup>[60]</sup>. More intervention than control screened (51% and 18% respectively) p<0.0001. Utilisation of cosmetologists as LHWs compared to a control intervention (diabetes) (n=984)<sup>[61]</sup> found no significant difference between groups but the attrition rate was high (50%). Significance was reached for both groups in the per protocol analysis (p<0.05). The use of LHWs to deliver a multifaceted educational program compared to usual care (n=801) reported an increase in screening from baseline, with the difference in uptake between the two groups borderline (p=0.05)<sup>[62]</sup>. A final LHW intervention targeted those people who already had an appointment for screening to usual care (n=367)<sup>[63]</sup>. The adjusted odds of intervention group screening was 2.31 compared to control. Overall, half LHW interventions were significant, with one borderline. The last was significant in the PP analysis but had retention issues.

A multi-stage escalating intervention, initially utilising reminder letter or usual-care (n=320), with those not screening randomised again to tailored letter or phone call<sup>[64]</sup>. Screening uptake was low (<20%), with no significant difference between groups.

A comparison of leaflet, video and interactive computer interventions (n=344) saw screening in 50% (computer), 29% (video) and 18% (pamphlet)<sup>[65]</sup>. A significant difference occurred between the video and computer groups ( $p=0.013$ ).

A comparison of group-educational classes to brochures (n=119) found significant increase in screening (80% intervention; 53% control) ( $p<0.01$ )<sup>[66]</sup>.

Four of the seven studies showed significant increases in screening uptake with one further borderline and another significant in only the PP analysis, but with methodological issues. The significant interventions all showed reasonable overall levels of screening (50%).

### Cervical Cancer Screening

Nine studies aimed to improve uptake of cervical cancer screening.

#### *Samoan(n=1)*

A church based trial (n=416) to evaluate a multifaceted educational program, comparing with usual care found the intervention group more likely to report screening than control (61.7%; 38.3% respectively  $p<0.01$ )<sup>[67]</sup>.

#### *Chinese Asian(n=4)*

Group educational sessions compared to usual care (n=370) saw a significant increase in screening from baseline in both (44% to 61% & 51% to 62%;  $p<0.001$  &  $p=0.027$  respectively) with differences between groups not significant<sup>[68]</sup>. A further group-education intervention, compared to sessions on general health (n=134) found a significant increase in the intervention group compared to control (70% v 11.1% respectively  $p<0.001$ )<sup>[69]</sup>. However, the two groups were not comparable and high baseline levels of screening limited the power of this study.

A study of effect of culturally and linguistically appropriate educational interventions (n=482) compared LHW to mailing information and usual care<sup>[70]</sup>. 39%, 25% and 15% of LHW, mail and control were screened, with both the LHW and mail interventions more effective than control ( $p<0.001$  and  $p=0.03$  respectively) and LHW more effective than mail( $p=0.02$ ).

A LHW intervention (n=1005) plus mass media was compared to mass media alone<sup>[71]</sup>. Both groups had significant increases in screening from baseline (intervention 65.8% to 81.8%; control 70.1% to 75.5%,  $p<0.001$  both) with LHW intervention significant over mass media alone ( $p=0.001$ ).

Three of the four interventions saw statistically significant increases in screening over control. The fourth saw increases in screening in both arms but a comparison of intervention and control was non-significant, thus perhaps another factor was contributory.



### *Hispanic and Mexican-American(n=2)*

Multiple interventions (print and video education versus either alone) was compared to control (n=613)<sup>[72]</sup>. Screening uptake was 52.3% in the combined intervention, 41.3% in video and 45.5% in the print group, all significantly increased compared to control (24.8%)  $p<0.001$ . However, there was no difference between interventions ( $p=NS$ ).

A comparison of a navigator to usual care (n=120) reported screening in 65% and 36% in the intervention and control arms respectively ( $p=0.02$ )<sup>[73]</sup>. Excluding those already up-to-date with screening, the intervention arm saw 71% screen with 22% in the control ( $p=0.004$ ).

### *Cherokee Indian(n=1)*

A LHW intervention (n=1020) aimed to control for pre-intervention sessions potentially acting as intervention<sup>[74]</sup>. They found a significant increase in screening (71%) versus control (65.1%)  $p=0.008$  in those receiving the pre-test and those that did not (62.5% of control and 76% of intervention  $p=0.007$ ). Thus, the intervention groups were more likely to screen than controls.

### *South East Asian(n=1)*

A study comparing home visits (video or factsheet) or mailed factsheet to usual care (n=737) and found no significant difference between control and any intervention<sup>[75]</sup>. Screening rates overall were very low, limiting statistical analysis.

## Hepatitis B (HBV) Screening

HBV is a global public health concern with particular at-risk populations, and has ongoing international focus on case-finding<sup>[76-78]</sup>.

### *Turkish-Dutch(n=1)*

An evaluation of a computer based interactive intervention, examining behavioural tailoring (BT) and behavioural and cultural tailoring (BCT) (n=1512) used a control of generic online information (GI)<sup>[79]</sup>. They failed to show significance in all three groups ( $p=0.74$ ). However, screening was considered high across all groups (43.9%, 43.5% and 46.0% in BCT, BT and GI respectively).

### *Asian American(n=7)*

The majority of studies (n=4) examined the effect of group education, all finding significant increases in screening uptake. Firstly, culturally appropriate group-education with a similar intervention on physical activity acting as control (n=250)<sup>[80]</sup>. The overall number screened was small, but significantly higher ( $p<0.001$ ) in the intervention group (20%) than control (3%). A second study (n=218) also compared group-education to a physical activity group control<sup>[81]</sup>. They found n=9 (11%) and n=6 (6%) in the intervention and control groups respectively tested ( $p=0.02$ ).

A further study compared group education to a brochure, with 33.6% of intervention and 9.7% of controls screened  $p<0.001$ <sup>[82]</sup>.

A comparison of church based group educational program against usual care found a significant increase in screening in the intervention group but not control (58.5% to 95.8%  $p<0.001$  and 38% to 39.8%  $p=NS$  respectively)<sup>[83]</sup>. For those never screened the rate of uptake in the intervention was 93.1% compared to 2.9% for control.

Two studies trialled the use of LHWs compared to a control of physical activity. The first (n=460) used a leaflet on physical activity and found 15% of intervention compared to 10% of control screened ( $p=0.21$ ) by self-report, but 6% compared to 2% by chart review ( $p=0.04$ )<sup>[84]</sup>. The second (n=260) compared a LHW educational session to the same intervention on physical activity<sup>[85]</sup>. This showed a significantly greater uptake in the intervention group ( $p=0.0119$ ), however, again the absolute numbers were small (19% intervention and 8% control).

A single study targeted primary care physicians (PCP) who received an electronic reminder of higher risk groups for HBV infection or usual care (n=75 physician; n=175 patients)<sup>[86]</sup>. Two primary outcomes existed, recommendation and completion of testing. 40.9% of intervention and 1.1% of control had testing requested ( $p<0.001$ ) with 34.1% intervention and none in control completing testing ( $p<0.001$ ).

Of these 7 interventions, 6 had significant improvements in screening but only one of which had high numbers screening overall (church based). The final study showed significance only when medical charts were reviewed, not by self-report and so it is unclear if this was an intervention effect.

### Prostate Cancer Screening

Two studies reviewed interventions to improve screening for prostate cancer, both in African Americans. However, there is still contention over the utility of screening for prostate cancer and its ability to improve overall mortality and prostate cancer specific outcomes<sup>[87-89]</sup>.

A multi-faceted intervention of navigators (n=1211) saw an initial education session for all participants with no further intervention for one group, the addition of a peer-navigator, client-navigator or both<sup>[90]</sup>. Significant interventions were peer ( $p=0.04$ ) and client-navigator ( $p=0.0001$ ). Combining navigators had no additional benefit. Overall, 65% of the study population had screening. A comparison of a mailed leaflet with or without LHW (n=242) defined screening as complete, incomplete or not screened<sup>[91]</sup>. They found the difference in uptake non-significant ( $p=0.279$ ). However, many did not receive the intervention (42%) and very small numbers actually screened (4.5% and 8% for in standard and enhanced groups respectively), limiting the power of the study.

We subsequently performed a simple review by intervention. The most common intervention was lay-health-workers and navigators (n=26). We grouped these together due to considerable overlap of their role. Of these 26 studies, 14 found statistically significant increases in screening, with one borderline and a further study significant only on medical-chart review but not self-report. The remaining 10 were non-significant. There was no link to either ethnicity or screening modality in either the significant or non-significant categories.

A further category was multi-faceted interventions. This was a heterogeneous group with a variety of interventions used across all ethnicities and screening modalities. There were 15

studies, of which 13 had significant increases in screening uptake. It is possible that the multitude of interventions appealed across the breadth of the target population leading to this apparent success rate. We do note, however, that some studies found no additional improvement in screening for multiple interventions over a single which has financial implications.

A group-education approach was utilised by 8 studies, of which 6 significantly increased screening uptake. It is worth noting that 6 studies involved Chinese-Asians and 2 African-Americans and 4 studies screened for HBV, and as such this group was relatively homogenous.

The use of media-intervention was only seen in 4 studies, with 3 being significant. These studies again covered a variety of ethnicities and conditions.

The final group was using the physician as the target of intervention (n=2) with both significant. The number of studies here though is small limiting the ability to draw conclusions.

## Discussion

Screening has a major role in healthcare delivery, however minority groups are under-represented, leading to interventions to tackle this inequality. In this review we note several themes emerging from these studies.

Firstly, the inclusion of those already compliant with screening guidelines was fairly consistent. Some studies included subgroup analysis of those not up-to-date and those never screened but this was not universal. Indeed, some cohorts had very high baseline levels of compliance suggesting recruitment was targeting the wrong population. Additionally, those who do screen are more likely to come forward for studies on preventative medicine.

Secondly, to improve the validity of our results we included only those studies who had a comparison group. However, the variability of having a true control (usual care), a control intervention and even comparing another intervention was a major factor in our inability to perform a meta-analysis. Furthermore, some papers compared different interventions without commenting on baseline screening rates, meaning it was not always clear how this intervention improved screening from baseline levels. Bearing these difficulties in mind, it seems multi-faceted interventions could be successful (86.7% increased screening), with navigation somewhat less successful (53.8%) and group education apparently successful (75%) but in a less heterogeneous cohort. Other interventions were in small numbers making conclusion difficult.

A key feature of our review was the measurement of uptake of screening. This varied between medical chart review and self-report. These were not always congruous, making self-report of uptake of screening a potentially problematic measure.

Despite interventions reaching statistical significance, the absolute numbers screening were often low. Given many of these interventions were labour intensive and costly we believe caution should be used when interpreting these findings. By contrast, some interventions without statistically significant improvements in screening saw high levels of screening uptake.

Overall, the mixture of methods, conditions and target populations unsurprisingly led to mixed results. This review illustrates the complexity in studying screening uptake, with no

single approach clearly more effective than others. This is compounded by the variety of methods, populations and study designs. We have considered whether a more limited search would have allowed a more robust review in the shape of a meta-analysis, however, our original aim was deliberately broad to add to the already narrowed literature in existence. Instead, we have highlighted some important concerns to consider, both in terms of results and in study characteristics for those planning studies in this important and developing area.

Our review had limitations. Firstly, we included only English language studies due to resource constraints. Secondly, we included all studies in our review, not excluding on the basis of quality although provided comment on quality. Thirdly, we included papers looking at different conditions and people in different countries with different health care systems that may not be comparable. This is an issue not only for analysis but when attempting to extrapolate findings from individual studies looking at a narrow range of people to the overall population. The inclusion of such a variety of populations and conditions can be viewed as both a strength and weakness as it adds information for strategies to improve screening across whole populations. We did not rate on the quality of the screening test or the quality of the screening program as they were outside the scope of this review. Furthermore, we did not assess the financial burden of providing these interventions but recognize this is a key factor in implementing these interventions. A summary of the main findings of this review are shown in table 4.

## Conclusion

Healthcare inequalities remain challenging. The inequalities in screening reflect those in other aspects of medicine, with ethnic minorities often having lower screening uptake. This has led to attempts to target these groups with interventions to improve uptake of screening that are often culturally and linguistically tailored. The heterogeneity of these groups and methodology of trials poses a challenge in analysing the data available. Overall, we feel standardisation of methods and outcome measures would further aid the ability to assess the role of targeted interventions in improving screening uptake amongst ethnic minorities our narrative review highlights these areas of disparity. However, we still found themes when reviewing the data by type of intervention. Multifaceted interventions were broadly successful as were group-education sessions and media interventions. Apparently less successful was lay-health worker interventions; despite being the most common intervention type.





### **Contributions:**

CK: Conceptualisation of the article, designed search parameters and performed the literature search and review, screening of papers, data collection and analysis, drafting of the article, critical revision of the article, approval and submission of the final version

MP: Performed the literature search and review, data collection and analysis, critical revision of the article, approval and submission of the final version

JH: Involved in the conceptualisation of the article, revised the article critically, approval of the submitted and final version

SdL: Involved in the conceptualisation of the article, revised the article critically, approval of the submitted and final version

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TV: Involved in the conceptualisation of the article, revised the article critically, approval of the submitted and final version

A Ala: Involved in the conceptualisation of the article, revised the article critically, approval of the submitted and final version

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<b>Adult members of the population who belong to an ethnic minority group</b>	<b>Any intervention aimed at improving uptake of health screening</b>	<b>Either usual care or another active intervention</b>	<b>Uptake of screening</b>
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Table 1: Study Characteristics for this review

Table 2: Inclusion and exclusion criteria for this review

Inclusion Criteria	Exclusion Criteria
Ethnic minority population (mixed groups >50% minority)*	No English language version of the paper available
Screening (or primary prevention) intervention	Study involving participants <18 years of age
Adults aged 18 years or older	Secondary prevention
Experimental/quasi experimental design with a control (no intervention, usual care or comparison intervention(s))	No original data (i.e. no systematic reviews)
Outcome measure available (uptake of testing/screening)	

\*'minority' was defined as all those not the major group (by number) in a population.

Table 3: DEF for selected studies

Author	Condi- tion	Design	N=	Ethni- city	Interventio- n	Contro- l Group	1 <sup>0</sup> Outco- me	Statisti- cally Signifi- cant?
<i>Colon Cancer Screening</i>								
Basch <sup>[31]</sup>	CRC	RCT	456	Africa- n Ameri- can	Telephone outreach	Mailed informa- tion	Verifie- d screeni- ng	Yes
Myers <sup>[32]</sup>	Colon	RCT	764	Africa- n Ameri- can	1. Mailed kit plus instructions and reminder 2. Same plus navigation	Active interve- ntions	Screeni- ng (notes)	Yes
Blumenthal <sup>[37]</sup>	CRC	RCT	645	Africa- n Ameri- can	1 to 1 education, grp education, reducing out of pocket costs	Leaflet distribu- tion	Screeni- ng as due(not es)	No (ITT)
Powe <sup>[38]</sup>	CRC	Pretest posttest design	106	Africa- n Ameri- can	1. Five phase intervention video (spiritual), calendar, poster, cultural brochure, handout, 2. video only	video only (non- spiritua- l) active interve- ntion	Screeni- ng	Yes
Holt <sup>[39]</sup>	CRC	RCT	316	Africa- n Ameri- can	Spiritual based group discussions	Non spiritua- l equival- ent	Screeni- ng Uptake	No (not betwee- n groups)
Katz <sup>[36]</sup>	CRC	RCT	270	Africa- n Ameri- can	Screening info (video and booklet) then tailored counselling	Screeni- ng info only	Screeni- ng Uptake (record- s)	Yes
Horne <sup>[33]</sup>	CRC	RCT	259 3	Africa- n Ameri- can	Printed materials and patient navigation	Printed materia- ls (active interve- ntion)	Screeni- ng Uptake	Yes

Jandorf <sup>[35]</sup>	CRC	RCT	350	African American	1. Health professional navigator 2. lay navigators	Usual Care	Screening uptake	No
Jandorf <sup>[34]</sup>	CRC	Randomized trial	240	African American	Peer v pro navigators	(Active intervention)	Screening Uptake	No
Lasser <sup>[48]</sup>	CRC	RCT	465	Mixed	PN-education, telephone calls	Usual care	Screening uptake( notes)	Yes
Braun <sup>[50]</sup>	CRC	Randomized trial	121	Native Hawaiian	Cultural presentation , FOBT kit & reminder call by matched ethnicity plus native physician and survivor stories, demo and multiple calls	presentation, FOBT kit & reminder call from non-matched ethnicity	Screening uptake	No
Walsh <sup>[51]</sup>	CRC	RCT	138	Latino & Vietnamese	1. Cultural brochure & kit 2. Above plus phone counselling	Usual Care	Screening (self)	Yes (v SOC)
Ma 2009 <sup>[49]</sup>	CRC	Quasi experimental design	167	Korean American	Addressing barriers and navigation	General health (church based)	Screening	Yes
Maxwell <sup>[52]</sup>	CRC	Community based randomized trial	548	Filipino American	1. Education session, free test kit, 2. education only	physical activity	Screening (self)	Yes, for both Interventions
Nguyen 2015 <sup>[40]</sup>	CRC	Cluster RCT	640	Vietnamese American	2 LHW educational sessions and FU,	LHW physical activity	Screening Uptake	Yes
Nguyen 2010 <sup>[41]</sup>	CRC	Quasi Experimental design	533	Vietnamese American	Media campaign, distribution of leaflets, hotline and provider info (seminars, DVD)	Usual Care	Ever Screened	Yes



Aragones <sup>[47]</sup>	CRC	RCT	65	Latino	Video and brochure with letter for physician	Standard of care	Completed screening	Yes	
Baker <sup>[45]</sup>	CRC	RCT	450	Latino	Mailed reminder letter, free kit, automated call and text, reminder, personal call if still needed	Standard of care	Screening as due	Yes	
Coronado <sup>[46]</sup>	CRC	Randomized trial	501	Hispanic	1. Mailed FOBT Mailed FOBT + Outreach	Usual Care	Uptake of screening	Y (V SOC no V each other)	
Christie <sup>[42]</sup>	CRC	RCT	21	Hispanic	Use of PN who scheduled test and chased pt. if needed	Usual care	Screening Completion	No	
Enard <sup>[43]</sup>	CRC	RCT	303	Latino	Tailored PN services (education, counselling, logistic support)	Mailed education (active intervention)	Screening uptake	Yes	
Fernandez <sup>[44]</sup>	CRC	RCT	665	Hispanic	1. Small media (DVD, flip chart) 2. interactive multimedia (tablets)	Usual Care	Screening uptake	No	
<i>Breast Cancer Screening</i>									
Hoare <sup>[53]</sup>	Breast Ca	RCT	527	Asian	Link worker providing information and encouragement on screening	Usual Care	Screening uptake	No	
Nguyen 2009 <sup>[54]</sup>	Breast Ca	RCT	1100	Vietnamese American	Targeted media education and LHW x2 education	Targeted media education (active)	Screening (self)	Yes	

Nguyen 2001 <sup>[55]</sup>	Breast Ca	Pretest/posttest controlled design	788	Vietnamese American	sessions and x2 calls Mass media campaign (leaflets, adverts, Physician meetings)	intervention) Usual care	Screening Uptake	No
Wang J <sup>[56]</sup>	Breast Ca	RCT	664	Chinese	1. Cultural Video 2. Generic Video 3. Printed fact sheet	Active intervention	Self-Reported Screening	No (Yes in subgroup analysis)
Lee EL <sup>[57]</sup>	Breast Ca	Cluster, randomized longitudinal, controlled trial	428	Korean American	Korean DVD, discussion at home with husbands, reiterating main points with PowerPoint	Nutrition education	Screening Uptake	Yes
Sauaia <sup>[58]</sup>	Breast Ca	Randomized Trial	4739	Latina	1. Printed intervention 2. Peer counsellor	Active intervention	Notes	No (unadjusted)
Calderon <sup>[59]</sup>	Breast Ca	Pretest posttest study design	400	Latina	Group discussion + video and self-exam training	Group discussion alone	Screening Uptake	No
Cardarelli <sup>[66]</sup>	Breast Ca	Non randomized controlled trial	119	African American	8 weekly sessions for education, cooking advice, prevention	Written materials (active intervention)	Screening Uptake	Yes
West <sup>[64]</sup>	Breast Ca	Randomized study	320	African American	Stage 1: personalized letter Stage 2: Letter or phone counselling	Stage 1: Usual care Stage 2: Active intervention	Self-Reported Screening	No (between groups) No (subgroup-never screened yes)
Russell <sup>[60]</sup>	Breast Ca	Randomized trial	181	African American	1. Cultural pamphlet and LHA, 2. Interactive tailored computer	Active intervention	Notes	Yes

Champion <sup>[65]</sup>	Breast Ca	Prospective randomized intervention design	344	African American	instruction and counselling session + LHA 1.Pamphlet 2. Culturally targeted video 3. Interactive computer program	Active Interventions	Screening	Yes, pc v video	
Sadler <sup>[61]</sup>	Breast Ca	Cluster RCT	984	African American	Beauty salon education materials, discussions, models for self-exam	Comparable diabetes program	Screening Uptake	No (ITT)	
Highfield <sup>[63]</sup>	Breast Ca	RCT then changed to quasi experimental	367	African American	Tailored telephone counselling, finding low cost appointments	Usual care	Screening Uptake (records)	Yes	
Earp <sup>[62]</sup>	Breast Ca	Cohort Design	801	African American	LHW monthly meetings and activities	Usual care	Self-reported screening	No	
<i>Cervical Cancer Screening</i>									
Mishra <sup>[67]</sup>	Cervical Ca	Randomized trial	416	Samoa	3 weekly education sessions culturally tailored (booklets, interactive, discussion)	Delayed intervention (leaflets) after data collected	Self-Reported Screening	Yes	
Mock <sup>[71]</sup>	Cervical Ca	Pretest posttest design	1005	Vietnamese American	LHW + Media Ed	Media alone	Ever screened & up to date	Yes	
Byrd <sup>[72]</sup>	Cervical Ca	Randomized Trial	613	Mexican American	1.Video and flip chart 2. Video 3. Flip chart	Standard of care	Screening	Yes (Intervention v Control)	
O'Brien <sup>[73]</sup>	Cervical Ca	Randomized trial	120	Hispanic	Workshops x2 3 hours long-educational	Usual Care	Screening Uptake	Yes	

Taylor 2002 <sup>[68]</sup>	Cervical Ca	RCT	370	Cambodian American	Home visits and group meetings that were education based	Usual Care	Self-reported screening	No (increase in both groups that was stats sig)	
Dignan <sup>[74]</sup>	Cervical Ca	Solomon Four Group Random assignment pretest posttest design	1020	Cherokee Indian	LHW gave individualized education	Usual care	Screening uptake Self-reported	Yes	
McAvoy <sup>[75]</sup>	Cervical Ca	Prospective cohort study	737	Asian	1. Visit & video 2. Visit, leaflet & factsheet 3. Posted leaflet and factsheet	Usual Care	Screening (notes)	Variable	
Wang X <sup>[69]</sup>	Cervical Ca	pilot study two arm quasi experimental design	134	Chinese	Education, interaction with physician, navigation	General health education	Self-Reported screening	Yes	
Taylor 2002 <sup>[70]</sup>	Cervical Ca	RCT	482	Chinese	1. Educational video, motivational pamphlet, fact sheet by mail 2. Above via outreach workers	Usual Care	Screening	Yes	
<i>Hepatitis B Screening</i>									
Van der Veen <sup>[79]</sup>	HBV	RCT	1512	Turkish Dutch	Behavioral tailoring v behavioral and cultural tailoring v general info	Generic online information	Screening Uptake	No	
Taylor 2013 <sup>[80]</sup>	HBV	RCT	250	Cambodian American	LHW delivered in homes: educational flip chart,	Mailed physical activity information	HBV Testing	Yes	

Taylor 2009 <sup>[84]</sup>	HBV	RCT	460	Chinese	pamphlet and DVD LHW intervention video pamphlet, visit to home	LHW physical activity	Screening (notes)	Yes, but very low numbers overall	
Chen <sup>[85]</sup>	HBV	Randomized controlled community study	260	Hmong	In home education and PN	Same program on physical activity	Self-Reported Uptake of testing	Yes	
Ma 2012 <sup>[83]</sup>	HBV	Pilot study with quasi experimental design	330	Korean American	Church announced cultural education program	Delayed intervention	Uptake of testing	Yes	
Hsu <sup>[86]</sup>	HBV	RCT	76 Doctors; 175 patients	Asian American	Electronic prompt to Primary Care Physician for HBV testing	Usual Care	1. Ordering of test 2. Uptake of test	Yes Yes	
Juon <sup>[82]</sup>	HBV	Cluster RCT	877	Asian American	Intervention 30min educational program	Pamphlet (active intervention)	Screening	Yes	
Taylor 2011 <sup>[81]</sup>	HBV	Group randomized trial	218	Asian Immigrants	3-hour long lesson on HBV	3-hour long lesson on physical activity	Screening Uptake	Yes	
<i>Prostate Cancer Screening</i>									
Weinrich <sup>[90]</sup>	Prostate Ca	Quasi experimental two by two factorial design	1211	African American	1. Peer (testimony, slides, brochure Q&A) 2. client navigation (slides, brochure Q&A & navigation help) 3. Combination	Active Intervention	Screening (complete or incomplete)	Yes	

Myers<sup>[91]</sup>

Prostate

Randomized trial

242

African American

n 4.  
Educational session only  
Standard intervention (booklet) or enhanced education session as well

Active intervention

Screening

No

Table 5: Summary of main findings of this review:

Interventions more likely to improve uptake of screening in this review:
<ul style="list-style-type: none"><li>○ Multi-faceted interventions</li><li>○ Group education sessions</li></ul>
Areas for future work:
<ul style="list-style-type: none"><li>○ Standardization of study methods utilizing interventions to improve uptake of screening</li><li>○ Consistency over the use of patients already compliant with screening programs</li><li>○ Standardization of outcome measures</li><li>○ Further studies on interventions where numbers are currently too small to assess their effect (e.g. media interventions)</li><li>○ Financial burden of interventions</li></ul>

