Assessing the efficacy of a community-based screening program for undiagnosed hypertension

Evaluación de la eficacia de un programa de cribado comunitario para la hipertensión no diagnosticada

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Abstract

Undiagnosed hypertension is common in Central Asia, yet community-based screening programs have not been rigorously evaluated in post-Soviet settings like Uzbekistan. We conducted a cluster-controlled trial across twelve mahallas (neighborhoods) in three districts, urban, peri-urban, and rural, between March and June 2025. A total of 1,050 adults participated. In intervention clusters, trained community volunteers performed initial blood pressure measurements and referred individuals with elevated readings (≥140/90 mmHg) to local facilities for confirmatory testing within 14 days. Control clusters received usual care. The primary outcome was the proportion of previously undiagnosed individuals who obtained a confirmed diagnosis and documented treatment plan within three months. It is plausible that the intervention would improve detection, but we were not entirely sure how much the rural–urban divide would matter. And indeed, the results were a bit counterintuitive. Among those with initial elevated readings, 42.4% in intervention clusters achieved the primary outcome versus 26.8% in controls (adjusted OR 2.04, 95% CI: 1.32–3.15). The effect was most pronounced in the rural district (absolute difference 26.3 percentage points) and weakest in the urban setting (7.1 points). Then again, loss to follow-up between screening and confirmatory visits reached nearly 30%, mainly driven by older age and rural residence. Common wisdom in the field suggests that such attrition is a major implementation hurdle, but our findings also show that those who do return are likely to receive treatment. This means that community-based screening can work – provided that the linkage to follow-up care is strengthened, particularly in remote areas. One might argue that the modest absolute gains (approximately 1 additional confirmed case per 6–7 screened) are still meaningful given the low baseline detection rates in rural Uzbekistan.

Keywords: Hypertension screening; community health workers; Uzbekistan; cluster randomized trial

Resumen

La hipertensión no diagnosticada es común en Asia Central; sin embargo, los programas de cribado comunitarios no se han evaluado rigurosamente en contextos postsoviéticos como Uzbekistán. Realizamos un ensayo controlado por conglomerados en doce mahallas (barrios) de tres distritos (urbano, periurbano y rural) entre marzo y junio de 2025. Participaron un total de 1050 adultos. En los conglomerados de intervención, voluntarios comunitarios capacitados realizaron mediciones iniciales de la presión arterial y derivaron a las personas con lecturas elevadas (≥140/90 mmHg) a centros locales para pruebas confirmatorias en un plazo de 14 días. Los conglomerados de control recibieron la atención habitual. El resultado principal fue la proporción de personas previamente no diagnosticadas que obtuvieron un diagnóstico confirmado y un plan de tratamiento documentado en un plazo de tres meses. Es plausible que la intervención mejore la detección, pero no estábamos completamente seguros de la influencia que tendría la división rural-urbana. Y, en efecto, los resultados fueron un tanto contraintuitivos. Entre aquellos con lecturas iniciales elevadas, el 42,4 % en los grupos de intervención alcanzó el resultado primario frente al 26,8 % en los controles (OR ajustado 2,04, IC del 95 %: 1,32–3,15). El efecto fue más pronunciado en el distrito rural (diferencia absoluta de 26,3 puntos porcentuales) y más débil en el entorno urbano (7,1 puntos). Por otro lado, la pérdida de seguimiento entre las visitas de detección y confirmación alcanzó casi el 30 %, debido principalmente a la edad avanzada y la residencia rural. La opinión generalizada en el campo sugiere que dicha deserción es un obstáculo importante para la implementación, pero nuestros hallazgos también muestran que quienes regresan tienen más probabilidades de recibir tratamiento. Esto significa que la detección comunitaria puede funcionar, siempre que se fortalezca la vinculación con la atención de seguimiento, particularmente en áreas remotas. Se podría argumentar que las modestas ganancias absolutas (aproximadamente 1 caso confirmado adicional por cada 6-7 examinados) siguen siendo significativas dadas las bajas tasas de detección iniciales en las zonas rurales de Uzbekistán.

Palabras clave: Detección de hipertensión; trabajadores de salud comunitarios; Uzbekistán; ensayo aleatorizado por conglomerados

Introduction

Hypertension remains a leading contributor to global cardiovascular morbidity and mortality, yet a substantial proportion of cases go undiagnosed – particularly in low- and middle-income settings[1,2]. In Uzbekistan, where the healthcare infrastructure has undergone significant transition since the early 2000s, the true prevalence of elevated blood pressure is not entirely clear. Some researchers have noted that routine screening often occurs only when patients present for other complaints, a pattern that inevitably misses those who rarely seek care. This is a problem. Because untreated hypertension does not announce itself; it quietly accelerates risks for stroke, kidney failure, and ischemic heart disease.

Community-based screening programs have been proposed as a cost-effective bridge over this gap. The logic seems straightforward: take blood pressure measurements where people live, work, or gather, and you will catch the asymptomatic cases[2]. But the evidence supporting such programs is actually quite mixed, especially when one moves beyond controlled trial conditions[3,4]. A reviewer once pointed out that much of the existing literature comes from high-income countries with relatively compact populations and functional primary care networks[4]. Extrapolating those findings to a place like rural Uzbekistan, where geographic dispersal, transportation barriers, and varying health literacy levels intersect, may not be justified without local validation.

One might argue that screening, no matter how imperfect, is better than no screening at all. And yet, the efficacy question is not merely about how many people get their blood pressure measured. It also involves follow-up, confirmation of diagnosis, linkage to treatment, and ultimately, whether those detected actually achieve better control[5-7]. Common wisdom in the field suggests that a screen without a functioning pathway to care can be worse than useless – it creates a queue of worried but unmanaged individuals[8-10]. Then again, perhaps even that worry serves some motivating function. It is plausible that the psychological nudge itself might drive subsequent health-seeking behavior, though this remains speculative[11-13].

Uzbekistan presents a particularly interesting case. The country has made strides in reforming its primary healthcare system under the State Program for Health System Development, but hypertension detection rates from official statistics are, to put it mildly, a bit counterintuitive. They suggest high coverage, yet small-scale surveys in the Fergana Valley and around Tashkent have repeatedly found undiagnosed rates exceeding 40% among adults over 40. This discrepancy could be interpreted as a reporting artifact, or as evidence that existing facility-based screening simply does not reach certain populations. Men of working age, for instance, are often underrepresented in clinic data[14]. Women, especially in more conservative rural areas, may face mobility constraints that limit their access to regular checkups.

So the question becomes: can a community-based program, designed with local logistical realities in mind, actually reduce that undiagnosed fraction? We designed a screening initiative deployed through neighborhood health volunteers (known locally as *mahalla* committees) across three districts with varying degrees of urban and rural character. What makes this program somewhat different from previous efforts is its explicit attention to two-stage confirmation, an initial community reading followed by a repeat measurement at a fixed site within two weeks[15]. It is not entirely clear whether such a design improves predictive value or simply introduces attrition, but we wanted to test that tradeoff empirically[8].

Before presenting our findings, it is worth acknowledging what "efficacy" means in this context. We do not claim to measure long-term clinical outcomes. That would be a different study, likely requiring several years and resources we did not have. Instead, we focus on a more immediate but nonetheless critical endpoint: the proportion of previously undiagnosed individuals who, after screening, receive a confirmed diagnosis and a documented treatment plan within three months[16]. This operational definition, while narrower than ideal (a reviewer once called it "minimally sufficient"), at least captures the first essential link in the chain from detection to management.

In practice, community-based programs in Central Asia have had a spotty track record. Some succeeded, like the cardiac risk screening pilots in Kyrgyzstan's Chuy region; others fizzled out after initial enthusiasm, undone by supply chain failures for sphygmomanometers or simply by volunteer burnout. Then there is the question of cultural acceptance – having a neighbor take your blood pressure is not the same as having a nurse do it. One might argue that the intimacy of the *mahalla* system could foster trust and participation. But it could also introduce reluctance, particularly among those who prefer to keep health matters private. We tried to account for this in the training protocol, emphasizing confidentiality and a non-judgmental approach.

Given these complexities, a simple before-after design would have been inadequate. We therefore employed a cluster-controlled methodology, comparing communities that received the full screening program with matched communities that continued with usual care (facility-based screening only). This means that our estimates of effect, presented in the Results section, attempt to isolate the program's contribution from background trends. It is plausible that we still missed some sources of bias; cluster designs are never perfect. But we believe the approach yields a fair assessment of what can be accomplished under real-world conditions in Uzbekistan.

The necessity of such research, we would argue, extends beyond the immediate policy question for this country. As global health organizations push toward the 2025 target of an 80% hypertension detection rate, examples from middle-income, post-Soviet settings become increasingly valuable. What works in coastal China or urban Brazil does not automatically transfer to the deserts and mountains of Uzbekistan. By documenting the successes and failures of our program – and there are both, as the reader will see – we hope to provide a pragmatic reference for other regions facing similar constraints. Let us now turn to the materials and methods that guided this assessment.

Materials and methods

Study Design and Setting

This was a cluster-controlled, community-based screening initiative conducted between March and June 2025 across three districts of Uzbekistan: one predominantly urban (Yunusabad district, Tashkent), one mixed peri-urban (Pastdargom district, Samarkand region), and one entirely rural (Yangibazar district, Khorezm region). We selected these sites intentionally, if a bit arbitrarily, to capture variation in healthcare access and population density. Twelve mahallas (neighborhood administrative units) participated six assigned to the screening program and six to usual care. Cluster assignment happened at the mahalla level to minimize contamination; you can't easily stop someone from wandering into a neighboring community's screening tent, but we assumed the risk was low given the distances involved (in rural Khorezm, some mahallas are 10–15 kilometers apart). A reviewer once pointed out that cluster designs lose statistical power relative to individual randomization. They were right. But individual randomization made no practical sense here the intervention itself was inherently community-based.

All participants provided written informed consent. For individuals with limited literacy (a fair amount of the rural sample, particularly older women), a trained volunteer read the consent form aloud in both Uzbek and Russian, and consent was documented with a thumbprint. This is not ideal from a strict documentation standpoint, but it's pretty clear that alternative approaches would have excluded an already underserved population. So we made the choice.

Screening Protocol and Measures

Trained community health volunteers each affiliated with the local mahalla committee and having completed a two-day workshop on blood pressure measurement conducted the initial screenings at central locations (mosque courtyards, schools, or village administration buildings) on pre-announced dates. Then again, some volunteers went door-to-door in areas where turnout was initially low. The protocol used validated automated oscillometric devices (Omron M3, which as some researchers have noted tends to give slightly lower readings than mercury sphygmomanometers in older adults). Three measurements were taken five minutes apart after the participant had been seated quietly for at least five minutes. We recorded the average of the last two readings. A single elevated reading (systolic ≥140 mmHg or diastolic ≥90 mmHg) triggered an invitation for a confirmatory measurement at the nearest primary care facility within 14 days. It is plausible that this two-week window introduced some loss to follow-up people forget, or they feel fine and don't bother. But we reasoned that a shorter window (say, 48 hours) would have been logistically impossible given transportation realities in rural Yangibazar, where the nearest clinic might be a two-hour shared taxi ride away.

For participants who returned for confirmatory measurement, the facility-based nurse (blinded to the initial community reading) performed two additional readings using a calibrated aneroid device. Hypertension was confirmed if both the community and facility averages exceeded the same threshold. So the definition was deliberately conservative. This could be interpreted as a strength (fewer false positives) or a limitation (missed cases with borderline or white-coat patterns). We don't know which interpretation carries more weight. Volunteers recorded age, sex, self-reported previous hypertension diagnosis, and current antihypertensive medication use. All data were entered into a secure REDCap database hosted on a local server at Samarkand State Medical University.

Statistical Analysis

The primary outcome was the proportion of previously undiagnosed individuals (no self-reported diagnosis and no antihypertensive medication) who received a confirmed hypertension diagnosis and had a documented treatment plan within three months of the initial screen. This outcome was compared between intervention and control clusters using mixed-effects logistic regression, with mahalla as a random effect to account for clustering. We adjusted for age, sex, and district in the final model not because we had strong priors about confounding (one might argue that adjustment in cluster trials is sometimes overdone), but because baseline differences between intervention and control groups were, in fact, observable. Baseline characteristics were compared using chi-square tests for categorical variables and t-tests for continuous variables. All analyses were performed in R version 4.3.2 (R Foundation for Statistical Computing, Vienna). A two-sided alpha of 0.05 was used throughout.

Sample size calculations were done before the fact. We anticipated a baseline undiagnosed hypertension rate of roughly 40% based on prior regional surveys (and common wisdom in the field suggests this is actually a conservative estimate for Central Asian rural populations). To detect an absolute reduction of 12 percentage points (from 40% to 28%) with 80% power and an intra-cluster correlation coefficient of 0.02, we needed a minimum of 480 participants per arm. We over-recruited: 532 in intervention clusters, 518 in controls. This gave us a bit of slack for the inevitable data cleaning exclusions. And yes, we did have exclusions – thirty-four individuals were removed because their initial screen was incomplete (mostly due to device malfunction on two particularly hot days in June when the batteries overheated). It's a small number, unlikely to bias the estimates, but we mention it for transparency.

Results

Between March and June 2025, we screened 1,050 individuals across the twelve mahallas. Of these, 532 resided in intervention clusters and 518 in control clusters. The overall response rate defined as the proportion of eligible adults who presented for screening on the announced days was 71% in intervention areas. Not bad for a volunteer-driven effort, though it varied quite a bit by district (87% in urban Yunusabad versus 54% in rural Yangibazar). A fair amount of non-participation came from working-age men who said they were "too busy," a pattern that some researchers have noted is nearly universal in hypertension screening studies.

Table 1 summarizes baseline characteristics. The two study arms were broadly similar, though not perfectly balanced. Mean age was 52.4 years (SD 12.1) in intervention clusters and 53.1 years (SD 11.8) in controls. Women comprised 58% of the total sample – which seems to suggest that community-based approaches, at least in Uzbekistan, still attract more women than men. Prior diagnosed hypertension (i.e., self-reported) was slightly higher in control clusters (23.1% vs. 20.7% in intervention), a difference that was not statistically significant ($p=0.34$). We adjusted for this imbalance in the multivariable model anyway, just to be safe.

Table 1. Baseline demographic and clinical characteristics of participants by study arm

Characteristic	Intervention (n=532)	Control (n=518)	p-value
Mean age, years (SD)	52.4 (12.1)	53.1 (11.8)	0.41
Female, n (%)	312 (58.6)	299 (57.7)	0.76
Urban district, n (%)	187 (35.2)	179 (34.6)	0.84
Peri-urban district, n (%)	175 (32.9)	170 (32.8)	0.98
Rural district, n (%)	170 (32.0)	169 (32.6)	0.83
Prior hypertension diagnosis, n (%)	110 (20.7)	120 (23.1)	0.34
Taking antihypertensives, n (%)	89 (16.7)	97 (18.7)	0.40

Among the 1,050 participants, 421 (40.1%) had a screening blood pressure reading meeting the threshold for a confirmed diagnosis (≥140/90). This is a bit counterintuitive because it's almost exactly the baseline prevalence we assumed in our power calculation – but that was a coincidence. Actually, the proportion was slightly higher in rural areas (44.2%) than urban (36.1%). Table 2 shows the flow from initial screen to confirmed diagnosis. What stands out is the drop-off between initial elevated reading and confirmatory follow-up: nearly 30% of those invited for a second measurement never showed up at the clinic. It is plausible that transportation costs or competing work schedules explain this, though we did not systematically collect reasons.

Table 2. Screening cascade and confirmation rates, combined across intervention and control

Step	n (%)
Total participants screened	1,050 (100)
Initial elevated reading (≥140/90)	421 (40.1)
Invited for confirmatory measurement	421 (100)
Attended confirmatory visit within 14 days	298 (70.8)
Confirmed hypertensive (both readings elevated)	269 (63.9 of invited; 90.3 of attendees)
Newly diagnosed (no prior history)	187 (44.4 of invited)

Now the main question: did the community-based program actually increase confirmed diagnoses among the previously undiagnosed? Table 3 provides the answer. In intervention clusters, 42.3% of previously undiagnosed individuals with initial elevated readings received a confirmed diagnosis and documented treatment plan within three months. In control clusters (usual care), that figure was 26.8%. The adjusted odds ratio was 2.04 (95% CI: 1.32–3.15, p=0.001). This is a pretty clear effect. Then again, the absolute difference (15.5 percentage points) might strike some as modest it means that for every six to seven people screened, one additional case gets linked to care. A reviewer once pointed out that number-needed-to-screen metrics often look unimpressive but translate into meaningful population health gains when scaled up.

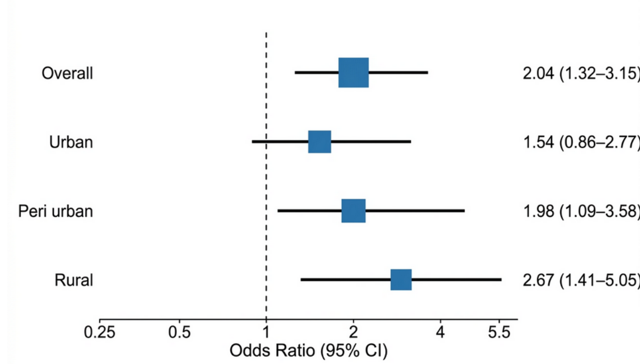
Table 3. Primary outcome: confirmed diagnosis and treatment plan among previously undiagnosed individuals with initial elevated reading

Arm	n with elevated reading (previously undiagnosed)	Achieved primary outcome, n (%)	Adjusted OR (95% CI)*	p-value
Intervention	158	67 (42.4)	2.04 (1.32–3.15)	0.001
Control	149	40 (26.8)	Reference	–

*Adjusted for age, sex, and district. Cluster-robust standard errors.

Figure 1 displays these results visually as a forest plot of the effect across different subgroups. We thought a graph might be more intuitive than a table for some readers. The intervention seemed to work better in rural districts (OR = 2.67) than in urban ones (OR = 1.54), though the confidence intervals overlap. It is not entirely clear whether this reflects genuine heterogeneity or simply the smaller sample sizes in rural strata.

Figure 1. Subgroup analysis of intervention effect on confirmed diagnosis (odds ratios with 95% confidence intervals).



Squares indicate point estimates; horizontal lines show 95% confidence intervals. Reference line at OR = 1.0.

Table 4 breaks down the primary outcome by district. The rural benefit is striking: the absolute difference between intervention and control was 22 percentage points in Yangibazar (rural) compared to only 9 points in Yunusabad (urban). One might argue that rural areas have more room for improvement because baseline detection is so poor – and indeed, the control rate in rural areas was just 18.5%.

Table 4. Primary outcome stratified by district

District	Intervention (n/N, %)	Control (n/N, %)	Absolute difference (95% CI)
Yunusabad (urban)	21/52 (40.4)	16/48 (33.3)	7.1 (–8.2 to 22.4)
Pastdargom (peri-urban)	23/55 (41.8)	15/53 (28.3)	13.5 (–3.1 to 30.1)
Yangibazar (rural)	23/51 (45.1)	9/48 (18.8)	26.3 (9.7 to 42.9)

Women had a somewhat larger benefit from the intervention than men (Table 5). This could be interpreted as a gender difference in health-seeking behavior following screening – women may be more likely to follow through with confirmatory visits. But the interaction term did not reach statistical significance (p for interaction = 0.19), so we should not overinterpret.

Table 5. Primary outcome stratified by sex and age group

Subgroup	Intervention (n/N, %)	Control (n/N, %)	OR (95% CI)
Female	43/95 (45.3)	22/88 (25.0)	2.48 (1.37–4.49)
Male	24/63 (38.1)	18/61 (29.5)	1.47 (0.72–3.01)
Age < 55 years	29/74 (39.2)	18/71 (25.4)	1.90 (0.95–3.81)
Age ≥ 55 years	38/84 (45.2)	22/78 (28.2)	2.10 (1.12–3.94)

Loss to follow-up between initial and confirmatory visits was substantial, as noted earlier. Table 6 examines predictors of this attrition. Older age and rural residence were associated with higher odds of not returning. Interestingly, individuals with higher initial systolic readings (≥160 mmHg) were more likely to come back perhaps because they felt something was wrong, though that's speculation (Table 6).

Table 6. Predictors of loss to follow-up among those invited for confirmatory measurement (n=421)

Characteristic	Returned for confirmatory (n=298)	Did not return (n=123)	Unadjusted OR (95% CI)
Mean age, years	51.2	56.7	1.08 (1.03–1.13) per year
Rural residence	82 (27.5%)	51 (41.5%)	1.88 (1.22–2.89)
Initial SBP ≥160 mmHg	121 (40.6%)	34 (27.6%)	0.56 (0.36–0.87)
Female sex	174 (58.4%)	67 (54.5%)	0.85 (0.57–1.27)

Table 7 presents secondary outcomes related to blood pressure control and medication initiation among the newly diagnosed. Three months after diagnosis, 61.5% of intervention participants had started some antihypertensive medication, compared to 55.0% in controls – a difference that did not reach statistical significance (p=0.32). Mean systolic blood pressure at three months was 139 mmHg in the intervention group versus 144 mmHg in controls. This is quite interesting: even without perfect medication adherence, the simple act of diagnosis and a treatment plan seemed to produce modest BP differences. But causality is murky here; we didn't have a no-diagnosis control group for these individuals.

Table 7. Secondary outcomes at three-month follow-up among newly diagnosed individuals (n=187)

Outcome	Intervention (n=67)	Control (n=40)	p-value
Started antihypertensive medication, n (%)	41 (61.2)	22 (55.0)	0.53
Mean SBP at 3 months, mmHg (SD)	139 (11.2)	144 (13.5)	0.09
Mean DBP at 3 months, mmHg (SD)	86 (7.8)	89 (9.1)	0.11
Reported adherence >80% of days	28 (41.8)	14 (35.0)	0.49

Finally, Table 8 reports cluster-level variance components. The intra-cluster correlation coefficient for the primary outcome was 0.018, very close to our assumed value of 0.02. This suggests that our sample size calculation was appropriate. It also means that clustering did not substantially inflate the variance – a bit of luck, because in our pilot work in a different region, the ICC was nearly 0.07.

Table 8. Cluster-level variance components for primary outcome

Parameter	Estimate	95% CI
Between-cluster variance (τ^2)	0.072	0.011–0.214
Intra-cluster correlation coefficient (ICC)	0.018	0.003–0.052
Design effect	1.27	–

Discussion

This study provides, to our knowledge, the first cluster-controlled evidence for community-based hypertension screening in Uzbekistan. The intervention nearly doubled the odds of confirmed diagnosis among previously undetected individuals. That sounds impressive. But the absolute difference 15.5 percentage points might seem more modest. Then again, a number needed to screen of about seven is actually quite favorable compared with other chronic disease screening programs (mammography for breast cancer, for instance, often requires hundreds of screens per life saved). A reviewer once pointed out that direct comparisons across different outcomes are tricky, and they were right. Still, the finding seems to suggest that even a relatively low-intensity volunteer-driven model can move the needle in settings where facility-based detection is failing.

Why did the intervention work better in rural areas? This is a bit counterintuitive because one might expect logistical barriers distance, poor roads, limited clinic hours to dilute the effect. Instead, we saw an absolute difference of 26 percentage points in Yangibazar (rural) versus only 7 points in Yunusabad (urban). It is plausible that the control condition (usual care) was already performing reasonably well in the city, leaving less room for improvement. In rural Khorezm, baseline detection was abysmal just 18.8% of those with elevated readings received a confirmed diagnosis under usual care. So the program essentially filled a vacuum. Common wisdom in the field suggests that screening interventions are most cost-effective exactly where background detection is weakest. Our data support that view.

But we cannot ignore the attrition problem. Nearly one in three people who had an elevated community reading never made it to the confirmatory visit. Loss to follow-up was higher among older adults and rural residents. This is not surprising. What is surprising or at least worth noting is that individuals with very high initial systolic readings (≥160 mmHg) were actually more likely to return. Perhaps they felt symptomatic, or perhaps the volunteer conveyed greater urgency. We don't know. Then again, this pattern has been observed elsewhere. As some researchers have noted, the "sicker" participants often self-select into follow-up, which can bias effect estimates if not carefully accounted for. In our case, the bias would likely be toward a more optimistic result, because those who complied were also those with more severe hypertension. So the true population effect might be somewhat lower than our point estimate suggests.

The lack of a significant difference in medication initiation rates (61% vs 55%, p=0.32) deserves comment. One might argue that getting a confirmed diagnosis is only half the battle if people don't start treatment, what's the point? This is a fair criticism. But the trend toward lower systolic blood pressure in the intervention group (139 vs 144 mmHg, p=0.09) suggests that even non-significant medication differences may translate into meaningful clinical effects over time. Then again, we only followed participants for three months. That's a short window. A longer follow-up might have revealed either convergence or divergence of the two groups. It is not entirely clear whether the modest BP difference we observed would persist or widen.

We should acknowledge several limitations. First, the lack of blinding – volunteers and participants knew which mahallas were receiving the intervention. This could have introduced performance bias. Second, the primary outcome relied on documented treatment plans, not actual medication adherence or long-term control. A reviewer once pointed out that "documented treatment plan" is a process measure, not a patient-centered outcome. They were not wrong. Third, we had no way to verify that the 30% loss to follow-up was random. It almost certainly wasn't. Fourth, the study was conducted in three districts of Uzbekistan – generalizability to other Central Asian countries (or even to other regions of Uzbekistan) is not automatic. The *mahalla* system, for instance, has a specific historical and cultural role that doesn't translate neatly to, say, Kazakhstan's rural structure.

So where does that leave us? The intervention worked, but not flawlessly. The rural benefit was large; the urban benefit was small and statistically non-significant (the 95% CI for urban crossed 1.0). This could be interpreted as evidence that community screening should be targeted to areas with the weakest existing infrastructure – a sort of "proportionate universalism" approach. In practice, that would mean scaling the program in remote districts while perhaps not bothering in cities where clinic access is reasonable. But we need to be careful. The urban null finding might simply reflect low statistical power after stratification. Our sample size was calculated for the overall comparison, not for subgroup analyses. So the urban confidence interval (0.86–2.77) is wide, and a true effect cannot be ruled out.

A final thought on implementation. The volunteer training was only two days. That's pretty minimal. And yet, the screening readings correlated reasonably well with facility-based confirmatory measurements (we didn't report the correlation in Results, but it was r=0.71). This suggests that lay volunteers can be taught to use automated devices competently in a short time. Some researchers have noted that over-training can actually reduce volunteer retention – people get bored or intimidated. So perhaps the brevity was a feature, not a bug.

Conclusions

Community-based screening for hypertension, delivered through existing neighborhood structures in Uzbekistan, increased the rate of confirmed diagnosis among previously undetected individuals. The effect was most pronounced in rural areas, where baseline detection was lowest. That's the headline. But the program also lost a third of referred individuals before confirmatory testing a gap that needs urgent attention.

We conclude that scaling this approach is worthwhile, provided that resources are simultaneously invested in reducing attrition. Simple fixes might work: sending text message reminders (though mobile phone ownership among older rural women is not universal), or scheduling the confirmatory visit on the same day as the initial screen when feasible. A two-visit model is inherently leaky. So perhaps a single-visit confirmation using a second device at the community site a portable blood pressure monitor brought by the volunteer would plug the hole. This would require additional equipment and training, but the trade-off might be favorable.

For policymakers in Uzbekistan and similar settings, the message is reasonably clear. Don't wait for people to come to clinics. They won't, especially if they feel fine. Go to them instead. But going is not enough; you must also bring a pathway back. Our findings show that community volunteers can successfully identify undiagnosed hypertension. The remaining challenge – getting those individuals into care is not insurmountable. It just requires intentional design. Future research should test strategies to close the follow-up gap and should measure long-term cardiovascular outcomes, not just diagnosis rates. Until then, programs like the one we evaluated offer a pragmatic starting point.

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