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Review Article

Therapeutic Advances, Diagnostic Innovations, and Strategic Priorities for Global Scabies Control: An Integrative Review

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A B S T R A C T

Scabies, caused by the mite Sarcoptes scabiei var. hominis, remains a widespread dermatological and public health concern, especially in low-resource settings where overcrowding and limited healthcare access are prevalent. Despite being curable, the disease is under-recognised and often complicated by bacterial superinfections, contributing to significant morbidity. This review critically explores the progression of scabies treatment, from conventional topical therapies such as permethrin and sulphur to systemic regimens like ivermectin and combination protocols for crusted scabies. New pharmacologic candidates—spinosad, moxidectin, and fluralaner—offer promising alternatives but require further study in vulnerable populations. Concurrently, diagnostic approaches are transitioning from subjective clinical assessments to enhanced technologies such as dermoscopy, AI-assisted image analysis, and portable microscopy, improving case detection and operational scalability. Mass drug administration (MDA) initiatives have reduced prevalence in several endemic regions but face implementation barriers, including resistance development, contraindications in key populations, and health system limitations. Persistent gaps in drug efficacy surveillance, diagnostic infrastructure, and research inclusivity impede sustainable progress. The review emphasises the need for integrated, equity-focused strategies—combining therapeutic innovation, diagnostic reform, and policy alignment—to move toward effective and enduring global scabies control.

Keywords: Scabies, ivermectin, permethrin, spinosad, moxidectin, fluralaner, mass drug administration, diagnostics, drug resistance, neglected tropical diseases, public health strategy

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Introduction

Scabies is a parasitic skin infestation caused by the mite Sarcoptes scabiei var. hominis, presenting a persistent and often overlooked challenge in dermatological and public health domains. Despite being preventable and treatable, scabies remains endemic across numerous low- and middle-income countries, especially in communities afflicted by poverty, high population density, and inadequate access to healthcare.[1] The formal recognition of scabies as a neglected tropical disease (NTD) by the World Health Organization in 2017 was a crucial milestone in acknowledging its global burden and socioeconomic impact.[2] However, this recognition has yet to translate into comprehensive, fully funded global control programs.[3,4]

Clinically, scabies is characterised by intense pruritus, often worsening at night, and a distinctive rash comprising papules, vesicles, and linear burrows. These symptoms can be misdiagnosed or undertreated, particularly in primary care settings with limited dermatologic expertise. Complications arise when secondary bacterial infections—commonly due to Streptococcus pyogenes and Staphylococcus aureus—lead to invasive disease and immune-mediated sequelae, such as post-streptococcal glomerulonephritis and acute rheumatic fever.[5,6] These outcomes are disproportionately observed in children within endemic communities, further exacerbating scabies' long-term morbidity and socioeconomic consequences.[4]

Current first-line treatments, including topical permethrin 5% and oral ivermectin, are widely used and supported by clinical guidelines. However, treatment failures have been increasingly reported, due in part to emerging acaricide resistance and systemic barriers to implementation, such as logistical limitations in mass drug administration (MDA) campaigns[7,8,9,10,11] Of note, permethrin resistance has been linked to mutations in voltage-gated sodium channel (VGSC) genes, while ivermectin MDA strategies often face operational setbacks—especially in excluding populations such as children under 15 kg and pregnant or lactating women.[5,6]

Recent therapeutic advances have highlighted moxidectin, a long-acting macrocyclic lactone, and spinosad, a newer agent with a distinct mechanism of action, as promising candidates. These medications may offer simplified dosing and improved pharmacokinetics, yet their long-term efficacy, safety in special populations, and integration into national treatment protocols remain insufficiently studied.[7,8] Alongside pharmacological innovation, diagnostic advancements using digital dermoscopy and AI-based image classification tools are being developed to overcome the challenges of misdiagnosis and under-recognition, particularly in remote or resource-limited settings.[12,13]

This paper seeks to critically assess the evolving therapeutic and diagnostic landscape of scabies, evaluate the performance of emerging treatments in diverse epidemiological settings, and identify critical knowledge gaps that hinder effective global response. By synthesising insights across clinical efficacy, implementation science, and health systems policy, this study aims to contribute to the development of a comprehensive, equitable, and evidence-based framework for scabies control and eventual elimination.

Methodology

We conducted an integrative literature review using a comprehensive, multi-database search strategy. Sources were identified through MEDLINE, EMBASE, Web of Science, Scopus, CINAHL, Global Health, and the Cochrane Central Register of Controlled Trials from database inception through August 2015 to June 2025. and the search words used were 'scabies', 'Sarcoptes', scabiei, 'neglected tropical disease, 'permethrin', 'ivermectin', 'spinosad', 'scabicidal agents', 'MDA', 'skin scraping', and 'scabies epidemiology'.

The search included both randomised and quasi-randomised controlled trials, observational studies, programme evaluations, and health systems reports that addressed scabies treatment efficacy, emerging therapies, diagnostic accuracy, mass drug administration (MDA) models, and operational challenges.

Eligible studies involved paediatric or adult populations with clinically diagnosed or laboratory-confirmed scabies and examined the use of conventional agents (e.g., permethrin, ivermectin, benzyl benzoate, and sulphur), as well as novel agents (e.g., spinosad, moxidectin, and fluralaner). Diagnostic methodologies included clinical algorithms, dermoscopy, microscopy, AI-assisted imaging, and field-adaptable digital microscopy. We also included reports of treatment failure, resistance surveillance, and implementation barriers.

Data were extracted and categorised into four domains: (1) therapeutic agents, (2) diagnostic tools, (3) MDA strategies, and (4) operational/policy considerations. Where applicable, outcome measures such as treatment success rates, diagnostic sensitivity/specificity, programme coverage, and resistance emergence were compiled into comparative evidence matrices. Findings were synthesised through narrative integration and critical thematic analysis. A random-effects meta-analysis was considered but not performed due to heterogeneity in study designs and outcome reporting.

Evolution of Therapeutic Strategies for Scabies Management

Scabies treatment has advanced from basic topicals to effective systemic regimens. Permethrin 5% remains first-line due to high efficacy, though resistance is rising.

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Sulphur and benzyl benzoate are low-cost but less tolerated. Crotamiton 10% cream or lotion is an approved scabicidal agent, but it has lower efficacy than permethrin and ivermectin and often requires repeated applications; it is therefore generally reserved as a second-line option or when first-line agents are not tolerated. Oral ivermectin revolutionised MDA but is contraindicated in young children and pregnant women. Resistance concerns highlight the need for surveillance and new options.[14,15,16,17]

Crusted scabies in immunocompromised patients needs prolonged combination therapy with ivermectin and topicals. Second-line drugs are limited by poor safety. Treatment gaps persist for vulnerable groups, highlighting the need for inclusive research, resistance tracking, and NTD programme integration. As detailed in Tables 1 and 2, treatment selection must consider clinical effectiveness and public health feasibility.

Emerging Therapies and Clinical Promise

Due to rising resistance and treatment failures, research is exploring new options. Spinosad, moxidectin, and fluralaner show promise with unique mechanisms and potential for broader public health use.[18,19]

Spinosad

Spinosad 0.9%, approved for scabies in patients ≥4 years, acts on nicotinic receptors causing mite death. It shows 70–84% cure rates with good safety and low resistance. However, data are lacking for children under 4, pregnant women, and crusted scabies, limiting its use in high-risk groups.[20,21,22]

Moxidectin

Moxidectin, a long-acting ivermectin analogue, offers potential for single-dose scabies treatment due to improved pharmacokinetics. Currently in Phase 2b trials, it shows promise but remains unlicensed and untested in infants and pregnant women.[25,26]

Fluralaner

Fluralaner, an isoxazoline used in veterinary medicine, shows strong anti-scabies activity in animals due to its long half-life and GABA-targeting action. However, it remains experimental, as no human trials or safety data exist.[28,29]

Fluazuron

Fluazuron, a benzoylphenyl urea that inhibits chitin synthesis in arthropods, has been explored in veterinary ectoparasite control and has been proposed as a potential adjunct candidate for scabies management. However, evidence for human scabies remains limited, and efficacy and safety data in humans are required before clinical consideration.

Diagnostics in Transition

Accurate scabies diagnosis is vital but often hampered by subjective methods and lack of standardisation. Traditional tools like skin scraping and dermoscopy improve accuracy but need skilled staff and lab support. New AI-based and portable devices offer promise, especially in low-resource areas. However, high costs, limited digital skills, and validation needs remain barriers to widespread use.[30,31,32,33,34,35]

The diagnostic armamentarium for scabies has expanded beyond traditional microscopy to include advanced noninvasive imaging and molecular tools. High-resolution techniques such as videodermatoscopy, reflectance confocal microscopy (RCM), and line-field confocal optical coherence tomography (LC-OCT) allow real-time, in vivo identification of mites and burrows. In parallel, PCR-based assays and isothermal amplification methods offer highly sensitive detection, including in low-burden or subclinical cases, and support emerging drug-resistance surveillance.

Mass Drug Administration (MDA) Models

Mass drug administration (MDA) has effectively reduced scabies in endemic areas, as shown by Fiji's SHIFT trial (32.1% to 1.9%). Similar success was seen in the Solomon Islands and India. However, ivermectin's contraindications in young children and pregnant women limit coverage and hinder optimal community impact.[36, 37]

Drug Resistance and Genetic Surveillance

Drug resistance in Sarcoptes scabiei is an emerging concern, threatening the sustainability of scabies control programmes. Permethrin resistance is linked to single-nucleotide mutations in the voltage-gated sodium channel (VGSC), reducing drug efficacy (Walton et al., 2004)[5] Ivermectin resistance is less defined but may involve P-glycoprotein-mediated efflux and alterations in chloride channels (Mounsey et al., 2017; Arlian et al., 2020)[7,12,] as shown in Table 6. Despite these findings, molecular diagnostics remain largely confined to research settings. Wider application of genetic surveillance tools is necessary to guide treatment policies and monitor resistance emergence.[38,39]

Expanded Economic and Operational Considerations

National scabies control needs coordinated funding and logistics. Though MDA with ivermectin is cost-effective, many countries face funding gaps and poor integration into NTD programmes. Scaling success requires sustained financing, regulatory support, and health system readiness.[40-43]

Operational barriers include weak infrastructure, limited trained staff, and lack of standardised diagnostics. Ivermectin procurement is fragmented without a global

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donation system. Integration with NTD programmes is poor due to differing treatment protocols, excluding high-risk groups like children under 15 kg. These challenges hinder scalable, sustainable implementation.[44,45]

The Future of Scabies Control: Research and Elimination Strategy

Despite its global burden, scabies remains under-researched and low in public health priority. Diagnostic tools like dermoscopy and clinical assessment vary in reliability, while advanced methods such as AI imaging and molecular assays remain in pilot phases. Drug resistance surveillance is limited to select research centres. The therapeutic pipeline is narrow, with promising agents like moxidectin still under evaluation and others limited by age or formulation. Trials often exclude vulnerable groups, reinforcing treatment inequities. Crusted scabies continues to lack standardised, evidence-based treatment protocols.[46]

No scabies vaccine has entered human trials, though preclinical studies show promise. Vaccine development could transform control, especially in high-risk settings. Elimination efforts should integrate scabies into expanded universal health coverage (UHC) and NTD programmes, with co-delivery through school deworming and community education to improve reach and reduce stigma. A phased elimination framework is shown in Figure 1 below.

This flowchart illustrates the multi-sectoral, phased strategy required for scabies elimination—from case detection and AI-assisted diagnostics to vaccine research, pharmacovigilance, policy harmonisation, and community-led MDA.Note. Figure adapted from WHO NTD Roadmap (2020)[1] and key strategy frameworks proposed by Marks et al. (2021)[6] and Bernigaud et al. (2020).[10]

Comprehensive Scabies Control Critical Analysis: Integrated Evidence

Based on the critical analysis and discussion of the scabies control study, I have consolidated all the individual tables into a single comprehensive table that captures the therapeutic, diagnostic, operational, and strategic dimensions of global scabies control.

Key Insights from Integrated Analysis: Comprehensive Assessment of Global Scabies Control ChallengesThe comprehensive analysis of global scabies control strategies reveals a complex landscape of interconnected challenges that demand immediate and sustained attention across multiple domains. The integrated evidence matrix demonstrates that current approaches face fundamental structural barriers that systematically undermine the effectiveness of control programmes, particularly in reaching the most vulnerable populations who bear the highest disease burden.

Critical Gaps Identified

Vulnerable population exclusion represents the most significant ethical and operational challenge, as children under 15 kg, pregnant women, and immunocompromised patients are systematically excluded from both research studies and treatment programmes. This creates a paradoxical situation where populations most affected by scabies—children experiencing 30-50% prevalence rates in endemic areas—have the most limited treatment options available.

Resistance Surveillance emerges as an equally critical gap, with limited operational capacity for monitoring drug resistance despite documented emergence of both permethrin and ivermectin resistance. While molecular mechanisms are increasingly understood, surveillance systems remain largely confined to research settings rather than being integrated into operational control programmes.

Diagnostic Standardisation represents a fundamental barrier to effective case management. Despite AI-assisted smartphone imaging showing >90% sensitivity in pilot studies, the absence of standardised, field-deployable diagnostic tools limits the reliability of case detection and programme monitoring.

Economic sustainability challenges are compounded by the absence of coordinated financing mechanisms specifically for scabies control, unlike other neglected tropical diseases with established donation frameworks.

Strategic Implications

Effective scabies control requires simultaneous advancement across therapeutic, diagnostic, operational, and policy domains, with particular attention to addressing systematic exclusion of vulnerable populations and developing sustainable, equity-focused implementation strategies.

Table 1.Comparative Evidence Matrix for Scabies Therapies and Public Health Use

Therapy	Resistance Evidence	Efficacy	<15kg / Pregnancy	Crusted Scabies	MDA Feasibility	Diagnostic Support	Long-Term Data
Permethrin 5%	Documented (VGSC)	Moderate–High	Safe in pregnancy only	Suboptimal	✕ Not feasible	Clinical-based only	Sparse

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Oral Ivermectin	Emerging	High	✕ Not approved	✓ With combo	✓ Proven in MDA	Requires diagnosis	Moderate
Spinosad 0.9%	Unknown	Moderate	✕ Not for <4 years	Unclear	✕ Not studied in MDA	Requires clinical aid	Limited
Moxidectin	Unknown	Promising	✕ No safety data	✓ Animal data positive	✓ Single-dose potential	✕ Not field-validated	None
Fluralaner	Unknown (preclinical)	Promising (in vitro)	✕ Unstudied in humans	Experimental	✕ Not feasible	✕ Not tested	Absent
Sulfur ointment	None reported	Low–Moderate	✓ Safe for all	Poor compliance	✕ Not practical	✕ Low diagnostic aid	Sparse
Benzyl benzoate	Minimal	Moderate	✓ Acceptable	✕ Limited for severe cases	✕ Not feasible	✕ None	Sparse

Legend: ✓ = Robust evidence; ✕ = Contraindicated or not feasible; "Unknown" = Not studied; "Promising" = Initial positive results pending trials.

Table 2.Comparative Evidence Matrix for Scabies Therapies and Public Health Use

Agent	Formulation	Efficacy	Indications	Limitations
Permethrin 5%[11]	Topical	85–95%	First-line; adults and children >2 months	Resistance; requires thorough application
Ivermectin[5]	Oral (200 µg/kg)	80–90%	MDA; crusted scabies; >15 kg weight	Contraindicated in pregnancy and <15 kg
Benzyl Benzoate[3]	Topical (10–25%)	70–85%	Low-cost settings	Irritation; not well tolerated in children
Sulfur (5–10%)[7]	Topical	60–70%	Infants, pregnant women	Poor compliance; unpleasant odor
Crotamiton (10%)	Topical (10% cream/lotion)	Variable; generally lower than permethrin	Second-line option; patients intolerant to first-line agents	Lower efficacy; often requires repeated applications; limited MDA utility
Spinosad[22]	Topical (0.9%)	>85% (preliminary)	Alternative option in US; head lice crossover	Limited data; expensive
Moxidectin[8]	Oral (Phase II)	Under investigation	Long half-life; potential for single-dose MDA	Not yet approved; trials ongoing

Table 3.Key Characteristics of Emerging Scabies Therapies

Agent	Class	Mechanism of Action	Efficacy	Limitations
Spinosad[22]	Spinosyn insecticide	Nicotinic acetylcholine receptor agonist	70–84% (1 dose)	Limited data in children <4, crusted scabies
Moxidectin[7]	Macrocyclic lactone	Glutamate-gated chloride channel modulator	Preliminary positive	Unlicensed; no pediatric/ pregnancy data
Fluralaner[9]	Isoxazoline (veterinary)	GABA-gated chloride channel inhibitor	Potent (in animals)	No human trials; safety in humans unknown
Fluazuron	Benzoylphenyl urea (veterinary)	Chitin synthesis inhibitor	Experimental / not established in humans	Limited evidence for scabies; no human clinical data

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Table 4.Diagnostic Tools for Scabies: Comparative Characteristics

Method	Description	Sensitivity/ Specificity	Advantages	Limitations
Clinical Diagnosis[3]	Based on signs/ symptoms and history	~60–80% / Variable	Rapid; no equipment required	Subjective; misclassification common
Skin Scraping + Microscopy[3]	Visualization of mite/ ova/feces	~50–90% / High (if positive)	Specific; confirms diagnosis	Requires microscope and skill
Adhesive Tape Test[35]	Transparent tape pressed on lesion, microscopy	~40–80% / Moderate	Simple; cheap; field-adaptable	Lower sensitivity; false negatives
Dermoscopy (Handheld)[34]	Visualizes burrows/ mite in vivo	~70–90% / Moderate–High	Non-invasive; immediate results	Needs training; limited access in rural areas
Videodermatoscopy	High-resolution video dermoscopy for in vivo mite/ burrow visualization	Under evaluation	Real-time imaging; enhanced detail vs standard dermoscopy	Equipment cost; training; limited validation
Reflectance Confocal Microscopy (RCM)	Noninvasive confocal imaging of epidermis enabling visualization of mites and burrows	High (specialist settings)	In vivo, high-resolution; useful for atypical/crusted cases	High cost; limited availability; trained operator required
Line-field Confocal Optical Coherence Tomography (LC-OCT)	High-resolution optical imaging combining OCT and confocal principles for epidermal assessment	Under evaluation	Real-time, in vivo imaging with high resolution	Limited availability; needs validation for routine use
PCR-based assays	Molecular detection of mite DNA from skin samples	High (laboratory-dependent)	Sensitive; can detect low-burden/ subclinical infection; supports resistance surveillance	Requires laboratory capacity; costs; sampling logistics
Isothermal amplification (e.g., LAMP)	Rapid nucleic-acid amplification without thermocycler	Under evaluation	Faster and potentially field-adaptable molecular detection	Assay standardization and validation needed
AI-assisted Smartphone Imaging[13]	Image recognition via ML models	>90% / High (pilot data)	Field-deployable; reduces diagnostic delays	Requires validation, device compatibility, internet
UV Fluorescence Imaging[35]	Detects burrows/ mite structures via fluorescence	Under evaluation	Potential in atypical/ crusted cases	Experimental; needs light source, trained interpretation
Portable Digital Microscopy[35]	USB-based live mite visualization	~60–85% (early reports)	Affordable; adaptable to field use	Limited resolution; not widely adopted

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Table 5.Outcomes of MDA Implementation in Selected Countries

Country	Population	Regimen	Coverage	Impact	Barrier
Fiji (SHIFT Trial)[4]	2,000+	Ivermectin (2 doses)	95%	↓ Scabies: 32.1% → 1.9% (12 months)	Exclusion of young children, pregnancy limitations
Solomon Islands[3]	26,000+	Ivermectin + permethrin	87%	Sustained prevalence <2%	Reinfection risk, follow-up logistics
India (pilot)[15]	3,000+	Ivermectin (1–2 doses)	70–80%	Up to 72% reduction in 6 months	Diagnostic limitations, partial coverage

Table 6.Molecular Mechanisms of Scabies Drug Resistance

Drug	Primary Mechanism	Molecular Marker	Clinical Impact	Diagnostic Approach
Permethrin[5]	VGSC gene mutation (target-site)	kdr-type SNPs (e.g., L925I)	Confirmed resistance in outbreaks	PCR, Sanger sequencing
Ivermectin[7]	Efflux pumps, channel downregulation	P-gp overexpression, Cl^- channel loss	Reduced efficacy in persistent cases	RT-qPCR, transcriptomic assays
Benzyl Benzoate[12]	Unknown	Not characterized	Suspected treatment failure clusters	No validated method

Table 7.Economic and Operational Considerations in Scabies Control

Domain	Strengths	Constraints
Cost-Effectiveness[4]	Long-term cost savings by reducing complications and reinfestation	High upfront costs for drug procurement, delivery, and monitoring
Health System Capacity[3]	Existing MDA delivery infrastructure in NTD programs	Limited dermatologic training, poor case recognition, staff shortages
Drug Availability[6]	Generic ivermectin exists	No coordinated donation; frequent stockouts; regulatory barriers
Integration Potential[1]	Aligns with LF/onchocerciasis control programs	Incompatible regimens; differing target populations
Donor Engagement[7]	Included in WHO NTD roadmap; gaining visibility	No dedicated fund; overshadowed by high-profile NTDs

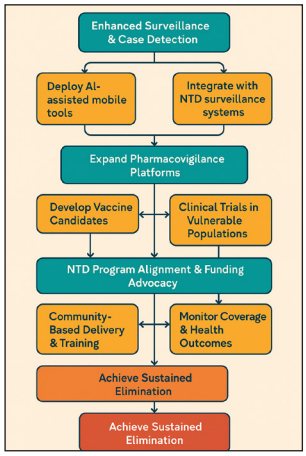

Figure 1.Policy and Research Roadmap for Scabies Elimination

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Integrated Scabies Control Evidence Matrix table 8

Category	Agent/ Method	Mechanism/ Description	Efficacy/ Performance	Safety Profile	Vulnerable Populations	MDA Feasibility	Resistance Evidence	Cost Implications	Implementation Barriers	Research Priority
Therapeutic Agents										
First-line	Permethrin 5%	VGSC disruption	85-95%	Safe in pregnancy	Safe >2 months	Not feasible	Documented (L925I, M918T)	Low drug cost	Resistance, application compliance	Resistance monitoring
	Ivermectin oral	Glutamate-gated Cl channels	80-90%	Generally safe	Contraindicated <15kg, pregnancy	Proven effective	Emerging (P-gp upregulation)	Moderate cost	Exclusion of vulnerable groups	Safety in excluded populations
Second-line	Benzyl benzoate	Contact acaricide	70-85%	Skin irritation	Acceptable in pregnancy	Not feasible	Minimal evidence	Very low cost	Poor tolerability	Limited research value
	Sulfur ointment	Contact acaricide	60-70%	Safe for all	Safe in all populations	Not practical	None reported	Very low cost	Poor compliance, odor	Formulation improvement
Emerging Therapies										
	Spinosad 0.9%	Nicotinic ACh receptor agonist	70-84% (single dose)	Good safety profile	Not approved <4 years	Not studied	Unknown	High cost	Limited age approval	Pediatric safety trials
	Moxidectin	Macrocyclic lactone	Promising (Phase II)	Under evaluation	No safety data	Single-dose potential	Unknown	Unknown cost	Unlicensed status	Phase III trials
	Fluralaner	GABA-gated Cl channels	Potent (animal models)	Unknown in humans	Unstudied	Not feasible	Unknown	Unknown cost	No human trials	Human safety studies
Diagnostic Methods										
Traditional	Clinical diagnosis	Signs/symptoms/ history	60-80% sensitivity	Non-invasive	Applicable to all	Field deployable	N/A	Minimal cost	Subjective, variable accuracy	Standardization protocols
	Skin scraping + microscopy	Mite/ova visualization	50-90% (if positive)	Minimally invasive	Applicable to all	Requires equipment	N/A	Low-moderate cost	Requires skilled personnel	Training programs
	Dermoscopy	In vivo burrow visualization	70-90% sensitivity	Non-invasive	Applicable to all	Portable options	N/A	Moderate cost	Training requirements	Standardized protocols
Emerging	AI-assisted smartphone	Machine learning image analysis	>90% sensitivity (pilot)	Non-invasive	Applicable to all	High potential	N/A	Moderate-high cost	Validation, connectivity needs	Multi-site validation

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	Portable microscopy	USB-based visualization	60-85% sensitivity	Non-invasive	Applicable to all	Field adaptable	N/A	Low-moderate cost	Resolution limitations	Technology improvement
Mass Drug Administration										
	Fiji SHIFT model	Ivermectin 2-dose	95% coverage achieved	Standard ivermectin profile	Excluded <15kg, pregnancy	Proven effective	Monitored	Cost-effective long-term	Island setting limitations	Mainland validation
	Solomon Islands	Ivermectin + permethrin	87% coverage	Combined safety profile	Excluded vulnerable groups	Sustained results	Unknown	Higher implementation cost	Logistical complexity	Simplified protocols
	India pilot	Ivermectin 1-2 doses	70-80% coverage	Standard profile	Excluded vulnerable groups	Moderate success	Unknown	Moderate cost	Diagnostic limitations	Diagnostic integration
Resistance Surveillance										
	Permethrin resistance	VGSC gene mutations	Treatment failure 15-30%	N/A	Affects all populations	Compromises MDA	Confirmed molecular markers	Surveillance cost	Limited laboratory capacity	Standardized monitoring
	Ivermectin resistance	P-glycoprotein mechanisms	Reduced MDA effectiveness	N/A	Affects all populations	Threatens sustainability	Emerging evidence	Surveillance cost	Research-based only	Operational surveillance
Operational Domains										
Health systems	Specialist capacity	Dermatology expertise	Variable globally	N/A	Affects diagnosis quality	Critical for programs	N/A	High training cost	Limited specialist availability	Capacity building
	CHW training	Community health workers	Improves case detection	N/A	Enhances equity	Enables scale-up	N/A	Moderate cost	Training sustainability	Standardized curricula
Economic	Drug procurement	Supply chain management	Affects program success	N/A	Determines access	Critical for MDA	N/A	Major cost component	No donation mechanism	Coordinated procurement
	Integration potential	NTD program alignment	Efficiency gains possible	N/A	Could improve coverage	Synergistic benefits	N/A	Cost savings potential	Incompatible regimens	Program harmonization
Strategic Priorities										
Research	Vaccine development	Multiple antigen targets	Preclinical stage	Unknown	Could benefit all	Revolutionary potential	N/A	High development cost	Early development stage	Accelerated research
	Inclusive trials	Vulnerable population studies	Critical evidence gaps	Safety priority	Primary beneficiaries	Enables universal coverage	N/A	Higher trial costs	Ethical considerations	Immediate priority

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Policy	UHC integration	Health system strengthening	Sustainability potential	N/A	Equity focus	Long-term solution	N/A	System investment	Political commitment	Policy development
	Elimination framework	Phased control strategy	Long-term goal	N/A	Population-wide benefit	Ultimate objective	N/A	Substantial investment	Coordination complexity	Strategic planning

Conclusion

Scabies remains a globally prevalent condition with significant clinical and public health implications. While first-line treatments like permethrin and ivermectin are effective, rising resistance and limited safety data in vulnerable populations demand alternative therapies such as spinosad, moxidectin, and fluralaner. Emerging diagnostic technologies show promise but require broader adoption and validation. Mass drug administration has reduced disease burden in some settings but faces operational and equity challenges. Sustainable control will require integrated strategies combining pharmacologic innovation, enhanced diagnostics, resistance monitoring, and inclusion within neglected tropical disease programmes, alongside investment in vaccine development and health system strengthening.

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