

Table S1. The PICOS framework used to establish the inclusion and exclusion criteria

	Inclusion criteria	Exclusion criteria
P (population)	<ul style="list-style-type: none"> • Studies focused on individuals aged 15 years and above. • Studies focusing on individuals at risk of HIV/involved in HIV testing. 	<ul style="list-style-type: none"> • Studies focused on individuals less than 15 years. • Studies not focused on individuals at risk of HIV/involved in HIV testing.
I (intervention)	<p>Studies that utilized ML algorithms to:</p> <ul style="list-style-type: none"> • Develop predictive models for HIV testing outcomes. • Enhance efficient and accurate HIV testing. • Develop predictive models to identify hidden HIV risk factors for improved HIV testing. • Optimize HIV testing procedures. 	<ul style="list-style-type: none"> • Studies that do not utilize ML interventions in the context of HIV testing.
C (comparison)	<p>Studies that compare:</p> <ul style="list-style-type: none"> • The accuracy/ efficiency of ML techniques and traditional methods in HIV testing interventions. • The accuracy/ efficiency of different ML algorithms for improved HIV testing. 	
O (outcome)	<ul style="list-style-type: none"> • Studies that reported: • The accuracy/ efficiency of ML algorithms employed to improve HIV testing. • Which methods are more accurate/ efficient regarding HIV testing; between ML and traditional methods. • Best-performing ML algorithms that can improve HIV testing. • Predictive models that can enhance early detection of HIV cases. • Predictive models that reveal hidden factors associated with HIV risk/ testing/ diagnosis. • Sensitivity and specificity of algorithms and ML diagnostic tools in the context of HIV testing. • Successes, gaps, opportunities, barriers, and challenges 	
S (Study Design/ Characteristics)	<ul style="list-style-type: none"> • Studies that employed ML algorithms prospectively/ retrospectively for improved HIV testing. • Studies conducted in English between 2010 to 2024. • Studies available in Full text. 	<ul style="list-style-type: none"> • Reviews • Studies reported in non-English languages • Not available in Full text • Conducted before 2010
Context	<ul style="list-style-type: none"> • Studies focused on ML and HIV testing conducted in any part of the world. 	