

The Same Social Media Pattern Found Again and Again in an 11-Year Study

A recent study accepted for publication examining the relationship between social media use (SMU) and [self-reported depression](#) (SRD) among U.S. adults across 11 annual surveys found a consistent association between higher levels of social media use and depression across the study period. The contribution of SMU to model-classified depression shifted from near-neutral to positive at approximately 150 minutes of daily use. However, the authors emphasize the need for more research to determine the clinical relevance of this observation.



Study

The current study sought to fill this gap using [machine learning](#) (ML) to analyze eleven annual repeated cross-sectional surveys of SMU, combining these data with contextual and demographic factors. This included about 183,000 adult participants aged 18 to 70 from 2014 to 2024, a period when platforms such as Instagram, Snapchat, and TikTok rose to prominence.

The researchers used interpretable ML methods to classify SRD across the adult [lifespan](#), examining how SMU contributed to the model's predictions and whether its contribution varied across levels of use.

The researchers examined online digital activity, including social media, [television](#), the internet, email, news, and gaming platforms, as well as patterns of use. However, the data were collected primarily in January of each year.

SRD was assessed as one of 31 health-related conditions, ranging from the use of corrective eyeglasses to high [blood pressure](#).

The authors recognize that this may lead to misclassification error, as some participants may have subclinical symptoms while others may falsely diagnose themselves as having [depression](#) or may not understand the question correctly. On the other hand, prior research using the same dataset found that SRD prevalence estimates closely matched national estimates of clinical depression prevalence.

[Model performance](#) was evaluated using several measures, including accuracy, Area Under the Receiver Operating Characteristic curve (AUROC), and Brier scores. The researchers also

examined feature importance to determine how much different variables contributed to depression classification.

The data showed increases in both SRD and average SMU over the [study period](#), with SMU positively associated with SRD after adjustment for demographic factors.

Findings

Across the six [media-use](#) categories, greater use was generally associated with higher odds of SRD after adjustment for covariates. Gaming and news had the highest and lowest median association, respectively. However, the association for news reached the study's corrected statistical significance threshold in only two of the 11 years.

After adjusting for covariates, [logistic regression analysis](#) showed that SMU was associated with SRD, with the odds approximately 17% higher for each additional hour of SMU per day. Similarly, increased internet, gaming, television, and email use were associated with higher odds of SRD.

An [exploratory analysis](#) suggested that when SMU was divided into quintiles, SRD prevalence consistently increased with higher-use quintiles, leading the researchers to evaluate the predictive importance of SMU by including it as a predictor of SRD in the model.

The authors used a [balanced random forest](#) (BRF) model and a logistic regression model (LR) on each of the eleven yearly datasets (2014–2024). BRF was selected because it can perform better when one outcome is less common, while logistic regression provided a conventional comparison.

The BRF models showed relatively consistent performance across the 11 datasets. Their accuracy ranged from 0.72 to 0.77, while AUROC values ranged from 0.66 to 0.74. This indicated that the models could discriminate between participants with and without SRD to a similar [degree](#) across survey years.

Temporal validation, in which models trained on 2014–2018 data were tested on 2019–2024 data, produced similarly moderate discrimination. Sensitivity analyses also suggested that the [COVID-19](#) period did not account for the overall SMU-SRD relationship observed across the study period.

The researchers then examined the specific contribution of social media use to the models using several analyses. These showed that SMU was consistently a strong predictor, along with personal income, [internet use](#), and age range, which together formed a stable set of important predictors over time.

SMU became increasingly prominent in later years, while personal income had the strongest overall importance when Gini, permutation, and SHAP rankings were considered together. “Across all years, greater social media exposure corresponds to higher SHAP values, indicating that this variable contributes substantially to the [model’s predictions](#) of depressive outcomes. This consistent pattern across all 11 years supports prior findings linking high SMU to elevated depression risk.”

The positive SHAP relationship became especially pronounced from 2021 onwards, indicating that its contribution to model predictions became more pronounced over time. Separately, at lower levels of social media use, its contribution was approximately neutral, shifting toward

positive at around 150 minutes (approximately two and a half hours) per day. The authors stressed that this value represents an exposure range identified within the model and should be treated as a hypothesis for future research rather than an established [clinical threshold](#).

Despite this, the authors caution that SMU's contribution to SRD classification may reflect other factors, such as changes in the distribution or measurement of the [exposure](#) and outcome, or interactions with other features incorporated in the model.

Subgroup analyses also showed differences by age and gender. Young women had a higher prevalence of SRD than young men, while model discrimination generally increased across older [age groups](#).

Conclusion

The findings indicate that SMU was consistently associated with SRD across U.S. [adult populations](#) surveyed between 2014 and 2024. The contribution of SMU to model-classified SRD shifted from approximately neutral to positive at about 150 minutes of SMU per day.

Using ML, the researchers also found that models incorporating SMU alongside demographic and other media-use factors classified SRD with moderate discrimination, with SMU consistently among the most [influential predictors](#).

However, the study did not distinguish between passive and active SMU, and the mechanisms underlying these associations remain hypothetical. The authors therefore call for longitudinal and experimental research to investigate whether the approximately 150-minute exposure range is clinically relevant and whether high SMU causally contributes to [mental health](#) risk.

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