Supplementary Material

**Social media analytics in nutrition research: A rapid review of current usage in investigation of dietary behaviours**

Part 1: Database searches across Scopus, Medline, CINAHL, ACM Digital Library and Engineering Village

Part 2: Original data charting tables

Table 2A: Eligible studies with social media analytics methodology in nutrition related research

Table 2B: Study author(s) disciplines or fields of research

Table 2C: Ethical approval, mentions and considerations

Part 1: Part 1: Database searches across Scopus, Medline, CINAHL, ACM Digital Library and Engineering Village

Database: Scopus Search title: Social Media Analytics in Nutrition Research with Scopus

Date searched: March 9, 2020 Results: n=1,577

Export method: Scopus supports .RIS export for up to 2,000 records.

|  |  |  |
| --- | --- | --- |
| Social media related keywords: | Data analytic and SMA keywords: | Nutrition (including targeted food and health) keywords: |
| Social mediaSocial media platformSocial listeningSocial network\*WebsiteOnlineInternetSocial communicationMobile communicationSocial networking siteFacebookTwitterInstagramYouTube | Data miningData analy\*Big dataMachine learningInfoveillanceInfodemiologyDashboardingReal time monitoringInformaticsCloud computingArtificial intelligenceBusiness analyticsMetrics | Nutri\* (nutrition, nutrients)Diet\* (dietetics; dietitian)Health Public healthDiabetesHeart DiseaseCardiovascular DiseaseCancerDigest\*Gastro\*GutOverweightObesity | EatingEating outMeal\*BreakfastDinnerDiningLunchSnack\*BeverageDrink\*AlcoholFast foodTakeawayJunk foodFood purchaseFood shoppingSupermarketRestaurant |
| **Social media limit to articles 2014-2020 in English = 216,690****TRIAL SEARCH**TITLE-ABS-KEY ( "Social media"  OR  "Social media platform"  OR  "Social listening"  OR  "Social network\*"  OR  website  OR  online  OR  internet  OR  "Social communication"  OR  "Mobile communication"  OR  "Social networking site"  OR  facebook  OR  twitter  OR  instagram  OR  youtube )  AND  ( LIMIT-TO ( PUBYEAR ,  2019 )  OR  LIMIT-TO ( PUBYEAR ,  2018 )  OR  LIMIT-TO ( PUBYEAR ,  2017 )  OR  LIMIT-TO ( PUBYEAR ,  2016 )  OR  LIMIT-TO ( PUBYEAR ,  2015 )  OR  LIMIT-TO ( PUBYEAR ,  2014 ) )  AND  ( LIMIT-TO ( DOCTYPE ,  "ar" ) )  AND  ( LIMIT-TO ( LANGUAGE ,  "English" ) ) **AND****Data analytic limit to articles 2014-2020 in English**TITLE-ABS-KEY ( "Data mining"  OR  "Data analy\*"  OR  "Big data"  OR  "Machine learning"  OR  infoveillance  OR  infodemiology  OR  dashboarding  OR  "Real time monitoring"  OR  informatics  OR  "Cloud computing"  OR  "Artificial intelligence"  OR  "Business analytics"  OR  metrics )  AND  ( LIMIT-TO ( PUBYEAR ,  2019 )  OR  LIMIT-TO ( PUBYEAR ,  2018 )  OR  LIMIT-TO ( PUBYEAR ,  2017 )  OR  LIMIT-TO ( PUBYEAR ,  2016 )  OR  LIMIT-TO ( PUBYEAR ,  2015 )  OR  LIMIT-TO ( PUBYEAR ,  2014 ) )  AND  ( LIMIT-TO ( DOCTYPE ,  "ar" ) )  AND  ( LIMIT-TO ( LANGUAGE ,  "English" ) ) **AND****Nutrition limit to articles 2014-2020 in English** TITLE-ABS-KEY ( nutri\*  OR  diet\*  OR  health  OR  "Public health"  OR  diabetes  OR  "Heart Disease"  OR  "Cardiovascular Disease"  OR  cancer  OR  digest\*  OR  gastro\*  OR  gut  OR  overweight  OR  obesity )  AND  ( LIMIT-TO ( PUBYEAR ,  2019 )  OR  LIMIT-TO ( PUBYEAR ,  2018 )  OR  LIMIT-TO ( PUBYEAR ,  2017 )  OR  LIMIT-TO ( PUBYEAR ,  2016 )  OR  LIMIT-TO ( PUBYEAR ,  2015 )  OR  LIMIT-TO ( PUBYEAR ,  2014 ) )  AND  ( LIMIT-TO ( DOCTYPE ,  "ar" ) )  AND  ( LIMIT-TO ( LANGUAGE ,  "English" ) ) **Nutrition limit to articles 2014-2020 in English** **OR**TITLE-ABS-KEY ( eating  OR  "Eating out"  OR  meal\*  OR  breakfast  OR  dinner  OR  dining  OR  lunch  OR  snack\*  OR  beverage  OR  drink\*  OR  alcohol  OR  "Fast food"  OR  takeaway  OR  "Junk food"  OR  "Food purchase"  OR  "Food shopping"  OR  supermarket  OR  restaurant )  AND  ( LIMIT-TO ( PUBYEAR ,  2019 )  OR  LIMIT-TO ( PUBYEAR ,  2018 )  OR  LIMIT-TO ( PUBYEAR ,  2017 )  OR  LIMIT-TO ( PUBYEAR ,  2016 )  OR  LIMIT-TO ( PUBYEAR ,  2015 )  OR  LIMIT-TO ( PUBYEAR ,  2014 ) )  AND  ( LIMIT-TO ( LANGUAGE ,  "English" ) ) **Nutrition limit to articles 2014-2020 in English** **FINAL n=4,061**( TITLE-ABS-KEY ( eating  OR  "Eating out"  OR  meal\*  OR  breakfast  OR  dinner  OR  dining  OR  lunch  OR  snack\*  OR  beverage  OR  drink\*  OR  alcohol  OR  "Fast food"  OR  takeaway  OR  "Junk food"  OR  "Food purchase"  OR  "Food shopping"  OR  supermarket  OR  restaurant ) )  OR  ( TITLE-ABS-KEY ( nutri\*  OR  diet\*  OR  health  OR  "Public health"  OR  diabetes  OR  "Heart Disease"  OR  "Cardiovascular Disease"  OR  cancer  OR  digest\*  OR  gastro\*  OR  gut  OR  overweight  OR  obesity ) )  AND  ( TITLE-ABS-KEY ( "Data mining"  OR  "Data analy\*"  OR  "Big data"  OR  "Machine learning"  OR  infoveillance  OR  infodemiology  OR  dashboarding  OR  "Real time monitoring"  OR  informatics  OR  "Cloud computing"  OR  "Artificial intelligence"  OR  "Business analytics"  OR  metrics ) )  AND  ( TITLE-ABS-KEY ( "Social media"  OR  "Social media platform"  OR  "Social listening"  OR  "Social network\*"  OR  website  OR  online  OR  internet  OR  "Social communication"  OR  "Mobile communication"  OR  "Social networking site"  OR  facebook  OR  twitter  OR  instagram  OR  youtube ) )  AND  ( LIMIT-TO ( LANGUAGE ,  "English" ) )  AND  ( LIMIT-TO ( DOCTYPE ,  "ar" ) )  AND  ( LIMIT-TO ( PUBYEAR ,  2019 )  OR  LIMIT-TO ( PUBYEAR ,  2018 )  OR  LIMIT-TO ( PUBYEAR ,  2017 )  OR  LIMIT-TO ( PUBYEAR ,  2016 )  OR  LIMIT-TO ( PUBYEAR ,  2015 )  OR  LIMIT-TO ( PUBYEAR ,  2014 ) ) **REFINE**Top 2,000 articles by date ranged searched for relevance by abstract and title n=48Next step rationalized social media keywords to the following:Social mediaSocial media platformSocial listeningSocial network\*Social networking siteFacebookTwitterInstagramYouTubeAdd: BlogTITLE-ABS-KEY ( "Social media"  OR  "Social media platform"  OR  "Social listening"  OR  "Social network\*"  OR  "Social networking site"  OR  facebook  OR  twitter  OR  instagram  OR  youtube  OR  blog ) n = 196,592Replace.Search as above.**Final search**( TITLE-ABS-KEY ( nutri\*  OR  diet\*  OR  health  OR  "Public health"  OR  diabetes  OR  "Heart Disease"  OR  "Cardiovascular Disease"  OR  cancer  OR  digest\*  OR  gastro\*  OR  gut  OR  overweight  OR  obesity ) )  OR  ( TITLE-ABS-KEY ( eating  OR  "Eating out"  OR  meal\*  OR  breakfast  OR  dinner  OR  dining  OR  lunch  OR  snack\*  OR  beverage  OR  drink\*  OR  alcohol  OR  "Fast food"  OR  takeaway  OR  "Junk food"  OR  "Food purchase"  OR  "Food shopping"  OR  supermarket  OR  restaurant ) )  AND  ( TITLE-ABS-KEY ( "Data mining"  OR  "Data analy\*"  OR  "Big data"  OR  "Machine learning"  OR  infoveillance  OR  infodemiology  OR  dashboarding  OR  "Real time monitoring"  OR  informatics  OR  "Cloud computing"  OR  "Artificial intelligence"  OR  "Business analytics"  OR  metrics ) )  AND  ( TITLE-ABS-KEY ( "Social media"  OR  "Social media platform"  OR  "Social listening"  OR  "Social network\*"  OR  "Social networking site"  OR  facebook  OR  twitter  OR  instagram  OR  youtube  OR  blog ) )  AND  ( LIMIT-TO ( LANGUAGE ,  "English" ) )  AND  ( LIMIT-TO ( DOCTYPE ,  "ar" ) )  AND  ( LIMIT-TO ( PUBYEAR ,  2020 )  OR  LIMIT-TO ( PUBYEAR ,  2019 )  OR  LIMIT-TO ( PUBYEAR ,  2018 )  OR  LIMIT-TO ( PUBYEAR ,  2017 )  OR  LIMIT-TO ( PUBYEAR ,  2016 )  OR  LIMIT-TO ( PUBYEAR ,  2015 )  OR  LIMIT-TO ( PUBYEAR ,  2014 ) )  |

Database: Medline via Ovid

Search title: Social Media Analytics in Nutrition Related Research with Medline

Date searched: March 9, 2020 Results: n = 85

Export method: Medline supports .RIS export.

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| --- | --- | --- |
| Social media related keywords: | Data analytic and SMA keywords: | Nutrition (including targeted food and health) keywords: |
| Social mediaSocial media platformSocial listeningSocial network\*Social networking siteFacebookTwitterInstagramYouTubeBlog | Data miningData analy\*Big dataMachine learningInfoveillanceInfodemiologyDashboardingReal time monitoringInformaticsCloud computingArtificial intelligenceBusiness analyticsMetrics | $Nutri\* (nutrition, nutrients)$Diet\* (dietetics; dietitian)Health Public healthDiabetesHeart DiseaseCardiovascular DiseaseCancerDigest\*Gastro\*GutOverweightObesity | EatingEating outMeal\*BreakfastDinnerDiningLunchSnack\*BeverageDrink\*AlcoholFast foodTakeawayJunk foodFood purchaseFood shoppingSupermarketRestaurant |
| Limits: English language; Humans; 2014-current("Social media" or "Social media platform" or "Social listening" or "Social network\*" or "Social networking site" or Facebook or Twitter or Instagram or YouTube or Blog).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]n=12191AND(Data mining or "Data analy\*" or "Big data" or "Machine learning" or Infoveillance or Infodemiology or Dashboarding or "Real time monitoring" or Informatics or "Cloud computing" or "Artificial intelligence" or "Business analytics" or Metrics).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]n= 52793AND($Nutri\* or $Diet\* or Health or "Public health" or Diabetes or "Heart Disease" or "Cardiovascular Disease" or Cancer or Digest\* or Gastro\* or Gut or Overweight or Obesity).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]n=1170178OR(Eating or "Eating out" or Meal\* or Breakfast or Dinner or Dining or Lunch or Snack\* or Beverage or Drink\* or Alcohol or "Fast food" or Takeaway or "Junk food" or "Food purchase" or "Food shopping" or Supermarket or Restaurant).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]N=81713 |

Database: Social Media Analytics in Nutrition Related Research with CINAHL

Date searched: March 9, 2020

Results: (Peer reviewed; 2014-2019; English language; Human) n= 1,259

Export method: Direct export x 2 batches to Endnote Web

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| --- | --- | --- |
| Social media related keywords: | Data analytic and SMA keywords: | Nutrition (including targeted food and health) keywords: |
| Social mediaSocial media platformSocial listeningSocial network\*Social networking siteFacebookTwitterInstagramYouTubeBlog | Data miningData analy\*Big dataMachine learningInfoveillanceInfodemiologyDashboardingReal time monitoringInformaticsCloud computingArtificial intelligenceBusiness analyticsMetrics | $Nutri\* (nutrition, nutrients)$Diet\* (dietetics; dietitian)Health Public healthDiabetesHeart DiseaseCardiovascular DiseaseCancerDigest\*Gastro\*GutOverweightObesity | EatingEating outMeal\*BreakfastDinnerDiningLunchSnack\*BeverageDrink\*AlcoholFast foodTakeawayJunk foodFood purchaseFood shoppingSupermarketRestaurant |
| Limits: Journals; English language; Humans; 2014-current"Social media" OR "Social media platform" OR "Social listening" OR "Social network\*" OR "Social networking site" OR Facebook OR Twitter OR Instagram OR YouTube OR Blogn= = 8,639AND"Data mining" OR "Data analy\*" OR "Big data" OR "Machine learning" OR Infoveillance OR Infodemiology OR Dashboarding OR "Real time monitoring" OR Informatics OR "Cloud computing" OR "Artificial intelligence" OR "Business analytics" OR MetricsN= =130,280AND$Nutri\* OR $Diet\* OR Health OR "Public health" OR Diabetes OR "Heart Disease" OR "Cardiovascular Disease" OR Cancer OR Digest\* OR Gastro\* OR Gut OR Overweight OR Obesity N = 350,324OREating OR "Eating out" OR Meal\* OR Breakfast OR Dinner OR Dining OR Lunch OR Snack\* OR Beverage OR Drink\* OR Alcohol OR "Fast food" OR Takeaway OR "Junk food" OR "Food purchase" OR "Food shopping" OR Supermarket OR Restaurant N= = 39,775 |

Database: Social Media Analytics in Nutrition Related Research with ACM Digital Library Full-Text Collection

Date searched: MARCH 9, 2020

Results: n = 1,608

Export method: Direct export to Endnote Web

|  |  |  |
| --- | --- | --- |
| Social media related keywords: | Data analytic and SMA keywords: | Nutrition (including targeted food and health) keywords: |
| Social mediaSocial media platformSocial listeningSocial networkSocial networking siteFacebookTwitterInstagramYouTubeBlog | Data miningData analyticsBig dataMachine learningInfoveillanceInfodemiologyDashboardingReal time monitoringInformaticsCloud computingArtificial intelligenceBusiness analyticsMetrics | NutritionDietHealth Public healthDiabetesHeart DiseaseCardiovascular diseaseCancerDigestionGastroGutOverweightObesity | EatingEating outMealBreakfastDinnerDiningLunchSnackBeverageDrinkAlcoholFast foodTakeawayJunk foodFood purchaseFood shoppingSupermarketRestaurant |
| Limits: 2014-current; Journals"query": { (("Social media" OR "Social media platform" OR "Social listening" OR "Social network" OR "Social networking site" OR Facebook OR Twitter OR Instagram OR YouTube OR Blog) AND ("Data mining" OR "Data analytics" OR "Big data" OR "Machine learning" OR Infoveillance OR Infodemiology OR Dashboarding OR "Real time monitoring" OR Informatics OR "Cloud computing" OR "Artificial intelligence" OR "Business analytics" OR Metrics) AND (Nutrition OR Diet OR Health OR "Public health" OR Diabetes OR "Heart Disease" OR "Cardiovascular disease" OR Cancer OR Digestion OR Gastro OR Gut OR Overweight OR Obesity OR Eating OR "Eating out" OR Meal OR Breakfast OR Dinner OR Dining OR Lunch OR Snack OR Beverage OR Drink OR Alcohol OR "Fast food" OR Takeaway OR "Junk food" OR "Food purchase" OR "Food shopping" OR Supermarket OR Restaurant)) }"filter": {"publicationYear":{ "gte":2014 }},{owners.owner=GUIDE} |

Database: Social Media Analytics in Nutrition Related Research with Engineering Village

Date searched: October 9 2019\* Subscription to this database ended in 2019 so the search could not be update in March 2020

Results: Journal articles and in press; English language; 2014-current n= 691

Export method: Can only export 500 .RIS files at one time. Two batches of export completed and combined in Endnote folder. Need to select Ei Compendex filter.

|  |  |  |
| --- | --- | --- |
| Social media related keywords: | Data analytic and SMA keywords: | Nutrition (including targeted food and health) keywords: |
| Social mediaSocial media platformSocial listeningSocial network\*Social networking siteFacebookTwitterInstagramYouTubeBlog | Data miningData analy\*Big dataMachine learningInfoveillanceInfodemiologyDashboardingReal time monitoringInformaticsCloud computingArtificial intelligenceBusiness analyticsMetrics | $Nutri\* (nutrition, nutrients)$Diet\* (dietetics; dietitian)Health Public healthDiabetesHeart DiseaseCardiovascular DiseaseCancerDigest\*Gastro\*GutOverweightObesity | EatingEating outMeal\*BreakfastDinnerDiningLunchSnack\*BeverageDrink\*AlcoholFast foodTakeawayJunk foodFood purchaseFood shoppingSupermarketRestaurant |
| Limits: Journal articles and in press; English language; 2014-current(((("Social media" OR "Social media platform" OR "Social listening" OR "Social network\*" OR "Social networking site" OR Facebook OR Twitter OR Instagram OR YouTube OR Blog))) AND ((({ja} OR {ip}) WN DT) AND ({english} WN LA))) n=2594 AND((("Data mining" OR "Data analy\*" OR "Big data" OR "Machine learning" OR Infoveillance OR Infodemiology OR Dashboarding OR "Real time monitoring" OR Informatics OR "Cloud computing" OR "Artificial intelligence" OR "Business analytics" OR Metrics)) AND ((({ja} OR {ip}) WN DT) AND ({english} WN LA)))n=237815 AND(((Nutri\* OR Diet\* OR Health OR "Public health" OR Diabetes OR "Heart Disease" OR "Cardiovascular Disease" OR Cancer OR Digest\* OR Gastro\* OR Gut OR Overweight OR Obesity)) AND ((({ja} OR {ip}) WN DT) AND ({english} WN LA)))N=350313 Final n=691 redo see saved( (((((((Eating OR {Eating out} OR Meal\* OR Breakfast OR Dinner OR Dining OR Lunch OR Snack\* OR Beverage OR Drink\* OR Alcohol OR {Fast food} OR Takeaway OR {Junk food} OR {Food purchase} OR {Food shopping} OR Supermarket OR Restaurant)) AND ((({ja} OR {ip}) WN DT) AND ({english} WN LA))) AND ((2019 OR 2018 OR 2017 OR 2016 OR 2015 OR 2014) WN YR))) AND (1884-2019 WN YR)) OR (((((Nutri\* OR Diet\* OR Health OR {Public health} OR Diabetes OR {Heart Disease} OR {Cardiovascular Disease} OR Cancer OR Digest\* OR Gastro\* OR Gut OR Overweight OR Obesity)) AND ((({ja} OR {ip}) WN DT) AND ({english} WN LA)))) AND (2014-2019 WN YR)))) AND ( (((({Data mining} OR {Data analy\*} OR {Big data} OR {Machine learning} OR Infoveillance OR Infodemiology OR Dashboarding OR {Real time monitoring} OR Informatics OR {Cloud computing} OR {Artificial intelligence} OR {Business analytics} OR Metrics)) AND ((({ja} OR {ip}) WN DT) AND ({english} WN LA)))) AND (2014-2019 WN YR)) AND ( ((((({Social media} OR {Social media platform} OR {Social listening} OR {Social network\*} OR {Social networking site} OR Facebook OR Twitter OR Instagram OR YouTube OR Blog))) AND ((({ja} OR {ip}) WN DT) AND ({english} WN LA)))) AND (2014-2019 WN YR)) |

**Part 2:** **Data charts**

**Table 2A: Eligible studies with social media analytics methodology in nutrition related research (alphabetical by first author)\***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Number** | **References****Author, Year, Country** | **SoMe** **Platform(s)** | **Dataset size****SMA summary** | **Nutrition relevance(s) and taxonomy** | **SMA Steps** **Data** **Discovery** | **SMA Steps** **Data Collection** | **SMA Steps** **Data Preparation** | **SMA Steps** **Data Analysis** |
|  | Abbar et al. 2015, Qatar on USA data (1) | Twitter | 892K tweets | Collected and analysed tweets from a sample of users and aimed to correlate food related messages with state-wide health data (obesity rates). Taxonomy: content analysis | 🗸 | 🗸Twitter API | 🗸 | 🗸LIWCGenderize API |
|  | Alhabash et al. 2018, USA (2) | Twitter | 47.5M tweets | Collected a large sample of tweets and performed content analysis to examine how the prevalence of tweeting about alcohol, along with tweet features, can predict tweet virality.Taxonomy: content analysis, engagement | 🗸 | 🗸Twitter API and geotagged tweets | 🗸 | 🗸LIWC |
|  | Alajajian et al. 2017, USA(3) | Twitter  | ~50M tweets | Developed a machine learning device called “Lexicocalorimeter” with the attempt to measure energy/caloric content of foods mapped across the USA population. Taxonomy: Content analysis | 🗸 | 🗸 | 🗸 | 🗸 |
|  | Blackstone, et al. 2018, USA (4) | Facebook | 617 individual posts of user data (original posts and comments) from 2 public Facebook fitness groups | Analysed posts from extreme fitness and nutrition groups for harmful health messagesTaxonomy: content analysis | 🗸Searched platform to obtain popular groups by member number | xManual compiled into Excel | ?No mention of cleaning data | xManual codebook |
|  | Carrotte et al. 2017, Australia (5) | InstagramFacebookTwitterTumblr | 36012439 | Collected posts with #fitspo to characterize food, body image and dieting messages by gender.Taxonomy: content analysis. | 🗸Tagboard.comPlatform search | x | x | x |
|  | Cavazos-Rehg et al. 2015, USA (6) | Twitter | 11,966,381 tweetsSubset 5,000 | Assessed the content of tweets with alcohol or drinking-related keywords to explore binge drinking behaviours.Taxonomy: content analysis | 🗸Purchased data from Simply Measured a private analytics company using Gnip to access Twitter firehose. After preparing keywords with [Topsy](http://topsy.thisisthebrigade.com/)  | 🗸Purchased data from Simply Measured.Assessed Klout scores | 🗸 | 🗸/xManual coding of subset by crowdsourcing using CrowdFlower |
|  | Chen et al. 2014, USA (7) | Twitter | 81,543 tweetsSubset ~350 | Collected tweets with mentions of grocery stores and fast food outlets to map relationship between food choices and exposure to local food environment. Taxonomy: content analysis | 🗸Open Source Python library and key word search | 🗸Open Source Python library | 🗸/xESRI ArcMap 2.0Manual coding | 🗸/xManual codingANOVA |
|  | ElTayeby et al., 2018, USA (8) | Facebook group | 4266 posts (text, images, video) within in one Facebook group “I’m Shmacked” | Investigated the feasibility of mining Facebook posts and machine learning to identify between alcohol drinking and non-alcohol posts with a view to exploring drinking behaviours in US College studentsTaxonomy: content analysis | 🗸Facebook Group member number and media reports | 🗸[Facebook Platform Python SDK](https://github.com/mobolic/facebook-sdk) and API | 🗸Human annotation to train machine learningCleaned links, hashtags, emoticons | 🗸Text classification using SVM or LDAImage and Video classification using AlexNet |
|  | Fried et al. 2014, USA(9) | Twitter  | 3M | Analysed food related tweets by hashtags (such as #dinner and #breakfast) and developed machine learning system to predict population characteristics such as overweight. Taxonomy: content analysis | 🗸 | 🗸 | 🗸 | 🗸Standford CoreNLPLDA |
|  | Huang et al. 2017, USA (10) | Twitter | 50M | Applied Natural Language Processing and machine learning methods to examine alcohol (and tobacco) tweets for temporal patterns by age group (including underage).Taxonomy: content analysis | 🗸 | 🗸Twitter API | 🗸Python | x/🗸PythonAmazon Mechanical Turk |
|  | Kershaw et al. 2014, UK(11) | Twitter | 31.6M | Designed exploratory machine learning model with the aim to assess alcohol related tweets for consumption patterns and compared to an existing health dataset. Taxonomy: content analysis | 🗸 | 🗸Twitter API | 🗸 | 🗸 |
|  | Karami et al. 2018, USA (12) | Twitter | 4.5million tweets | Analysed using machine learning text in tweets to characterize health opinions in diabetes, diet, exercise and obesity (DDEO)Taxonomy: content analysis | 🗸Used keys word and hashtags on twitter  | 🗸Used Twitter API for real-time data collection of 1% of tweets in time period | 🗸Standard list for removing stop words. Log-likelihood estimation to find optimum number of topics | 🗸Topic modelling using Mallet implementation of LDA and LIWC to find health related topics and subtopics |
|  | Mejova et al, UK and Qatar using USA data (13) | InstagramFoursquare | 20K194K | Designed machine learning model to analyse posts for food consumption patterns with the aim to correlate with obesity rates and location of fast food restaurants. Taxonomy: content analysis | 🗸 | 🗸 | 🗸 | 🗸/xDatascience toolkit APIInstagram Endpoints APICrowdflower |
|  | Nguyen et al. 2016, USA (14) | Twitter | 80 million geotagged tweets | Validated machine learning for constructing indicators of happiness, food and physical activity via location (neighbourhoods) compared to census dataTaxonomy: content analysis | 🗸Twitter API and geolocator | 🗸Extracted 1% tweets using Twitter API and geolocator and used Python to assign zipcode | 🗸Divided text into tokens using Stanford Tokenizer | 🗸Sentiment analysis using machine learning (MALLET) and extraction of food and physical activity mentions and frequencies matched to constructed food list |
|  | Nguyen et al. 2017, USA (15)  | Twitter | 422,094 tweets  | Collected food and physical activity tweets sent from one USA state (Utah) and compared sentiment to health data on overweight and obesity to demonstrate validity of Twitter-derived neighborhood characteristics Taxonomy: content analysis | 🗸Twitter API and geolocator | 🗸Extracted 1% tweets using Twitter API and geolocator and used Python to assign zipcode | 🗸Divided text into tokens using Stanford Tokenizer | 🗸Sentiment analysis using machine learning (MALLET) and extraction of food and physical activity mentions and frequencies matched to constructed food list |
|  | Nguyen et al. 2017, USA (16) | TwitterYelp | 4,041,521 tweets505,554 reviews | Collected food data from Twitter and Yelp to characterize food environments of different locations to create a state level food database in the USA and compare to Government data. Taxonomy: content analysis | 🗸 | 🗸Twitter APIYelp search APIOpenStreetMap | 🗸 | 🗸MALLETPython |
|  | Ofli et al. 2017, USA and Qatar(17) | Instagram | 1.9M images | Collected Instagram food images and hashtags and used image recognition technology to study differences in how a human describes the food compared to machine learning. Taxonomy: content analysis | 🗸 | 🗸Python using Shapely | 🗸 | x/🗸Manual classification using Amazon Mechanical Turk |
|  | Pang et al. 2015, USA(18) | Instagram | 195,000 images | Collected Instagram images with alcohol hashtags and used facial recognition technology to determine patterns of drinking in underage consumers. Taxonomy: content analysis | 🗸/ x | 🗸 | 🗸 | 🗸Face processing toolkit Face++ |
|  | Phan et al. 2019, Switzerland(19) | Instagram | 1.6M | Analysed Instagram alcohol related posts and compared to an existing dataset in order to develop machine learning systems that monitor alcohol consumption.Taxonomy: content analysis | 🗸 | 🗸 | 🗸 | 🗸 |
|  | Primack et al. 2015, USA(20) | YouTube | 200 videos retrieved and 70 videos coded related to alcohol intoxication | Collected and manually coded YouTube videos for sentiment related to alcohol intoxication to characterize the popular content Taxonomy: content analysis | 🗸Keyword search on platform to obtain popular videos by views | xManualcollection of views, likes, dislikes | xManualsorting | xManualcoding including of content sentiment using codebook |
|  | Rahman et al. 2016, Bagladesh(21) | Foursquare and Twitter | 731 Twitter users | Collected tweets on Foursquare restaurant checkins and designed predictive machine learning model with the aim to assess if tweet words can predict eating out preferences. Taxonomy: content analysis | 🗸Greptweet.com | 🗸 | 🗸 | 🗸LIWCWEKA |
|  | Rich et al. 2016, UK(22) | Instagram | 800,000 images  | Analysed Instagram food images with the aim to improve machine learning food image recognition. Taxonomy: content analysis | 🗸Instagram API | 🗸Instagram API | 🗸 | 🗸 |
|  | Shah et al. 2020, USA (23) | Twitter | ~10M tweets50,000 food subset  | Designed a high performance machine learning model to classify food tweets across Canada and demonstrated correlation between the location of high caloric food tweets and Government consumption data. Taxonomy: Content analysis | 🗸Twitter API | 🗸Customised machine learning model | 🗸Customised machine learning model | 🗸Customised machine learning model |
|  | Sharma et al. 2015, USA (24) | Instagram | 1.8M | Collected posts with food hashtags and designed a machine learning model to link posts to USDA National Nutrient Database and estimate calorie information.Taxonomy: content analysis  | 🗸 | 🗸Instagram API | 🗸 | x/🗸 |
|  | Silva et al. 2017, Brazil and UK (25) | Foursquare | Varied ~5M | Collected data from location based network (Foursquare) checkins on eating and drinking habits and proposed a methodology to identify boundaries and similarities across populations.Taxonomy: content analysis  | 🗸 | 🗸Foursquare/Twitter API | 🗸 | 🗸 |
|  | Sullivan et al. 2016, USA (26) | Amazon.com user-generated reviews | 40,0000 reviews of 2,708 products | Collected Amazon.com reviews of nutritional supplements and used unsupervised natural language processing techniques to capture adverse reactions and design system to score products on adverse reaction potentialTaxonomy: content analysis and surveillance | 🗸Web crawler to obtain reviews under set categories e.g. “Herbal supplement” | 🗸Web crawler to obtain reviews under set categories e.g. “Herbal supplement” | 🗸Topic modelling using unsupervised Latent Dirichlet Modelling (LDA) and subfield of Natural Language Processing | 🗸Topic modelling using unsupervised Latent Dirichlet Allocation (LDA) a subfield of Natural Language Processing to develop scoring system of risk for each product |
|  | Sun, et al. 2018, China and UK using USA data (27) | Twitter | 41 million tweets (compared to USA CDC data) from 110 major cities over 12 months | Collected and analysed tweets to show relation with Government obesity data and Twitter derived dietary habits of users.Taxonomy: content analysis (view to surveillance) | 🗸 | 🗸 | 🗸 | 🗸 |
|  | Turner-McGrievy et al. 2015, USA (28) | Twitter | ? | Collected tweets over 1 year with #fitness, #diet, #health and “weight” to explore temporal trends (influence of holiday period on frequency).Taxonomy: content analysis, surveillance | 🗸Hashtagify.me | 🗸peoplebrowsr | ? | ? |
|  | Vidal et al. 2015, Uruguay & NZ (29) | Twitter | 48,746 original tweets and then subset 16,000 per 4 topics and manual coding 12,000 | Explored main topics in tweets on breakfast, lunch, snack and dinner to evaluate Twitter’s potential as a research tool.Taxonomy: content analysis | 🗸Tweets containing key words breakfast, lunch, dinner and snack from researchers Twitter account | 🗸TwitterR Package | 🗸TwitterR Package removed duplicates and retweets and cleaned data | xManual coding of subset of tweets |
|  | Vydiswaran et al., 2019, USA (30) | Twitter | 21.19M TweetsMultiple subsets | Demonstrated that Twitter can be used to characterize neighborhood-level food-related behaviours and attitudes / sentiment in food-related tweets.Taxonomy: content analysis | 🗸Twitter API | 🗸 | 🗸/x | 🗸/xManual coding of subsets |
|  | Widener et al. 2014, USA (31) | Twitter | 148,533 tweets | Collected geolocated Twitter data in the USA and applied advanced data-mining framework to explore if prevalence of healthy and unhealthy food mentions could be mapped in line with USDA data. Taxonomy: content analysis | 🗸Twitter API | 🗸 | 🗸 | 🗸Alchemy API for sentiment analysis |
|  | Wombacher et al. 2017, USA (32)  | Twitter | 851 tweets | Analysed Twitter data using hashtag #NeckNominate to identify normative forces at play in a popular, dare based alcoholic drinking gameTaxonomy: content analysis | 🗸Tweets detected using Topsy social media analytics website | 🗸Tweets detected using Topsy social media analytics website | ?undescribed | xManual coding of text, themes, sentiment, links, retweets |
|  | Yan et al. 2015, China (33) | Koubei (online community) | 10,136 restaurant reviews in Harbin China location on Koubei | Analysed online restaurant reviews to assess revisit intent and obtain evaluation indicators of which healthy was important in food quality. Taxonomy: content analysis  | ? | ? | ? | 🗸Used text mining technology |
|  | Zhou et al. 2018, China (34) | Weibo (Chinese) | 3,975,800 microblogs | Used popular Chinese social media site to detect different preferences in types of meals using sentiment analysis and trends over time.Taxonomy: content analysis and surveillance | 🗸 | 🗸 | 🗸 | 🗸 |

\*Social media analytics (SMA) key:

🗸 SMA was described for the relevant step

X Manual extraction, coding or analysis by humans was described for the relevant step

 🗸/x A combination of SMA and manual processes were described for the relevant step

? The details could not be clearly identified for the relevant step

**Table 2B Data chart: Study author(s) disciplines or fields of research (alphabetical by first author) where identifiable\*\***

|  |  |  |  |
| --- | --- | --- | --- |
| **Study** | **SoMe****Platform(s)** | **Health, Medicine, other related** | **Business, Informatics, Computer Science, other related** |
| Abbar et al. (1) | Twitter | x | Computing |
| Alhabash et al. (2) | Twitter | Health | Computer science, Advertising, Data mining |
| Alajajian et al.  | Twitter  | Culinary Arts and Food Science | Mathematical and Computer Science |
| Blackstone et al. (4) | Facebook | Public Health, Health Science | x |
| Carrotte et al. (5) | InstagramFacebookTwitter, Tumblr | Health, Medicine | x |
| Cavazos-Rehg et al. (6) | Twitter | Psychiatry, Medicine | *Assisted by external social media analytics companies* |
| Chen et al. (7) | Twitter | x | Geography |
| ElTayeby et al. (8) | Facebook group | Health Science | x |
| Fried et al. (9) | Twitter | ? | ? |
| Huang et al. (10) | Twitter | Public Health  | Statistics, Engineering  |
| Karami et al. (12) | Twitter | Public Health | Information Science |
| Kershaw et al. (11) | Twitter | x | Computing, Management Science |
| Mejova et al. (13) | InstagramFoursquare | ? | Computing  |
| Nguyen et al. (14) | Twitter | Health, Global Health  | Computing, Geography, Sociology |
| Nguyen et al. (15)  | Twitter | Epidemiology, Biostatistics, Public Health | Computing, Geography, Sociology |
| Nguyen et al. (16) | TwitterYelp | Epidemiology, Health | Computing, Geography, Sustainability |
| Ofli et al. (17) | Instagram  | x | Computing  |
| Pang et al. (18) | Instagram | ? | ? |
| Phan et al. (19) | Instagram | x | Artificial Intelligence |
| Primack et al. (20) | YouTube | Medicine, Public Health | x |
| Rahman et al. (21) | TwitterFoursquare | x | Engineering and Technology |
| Rich et al. (22) | Instagram | x | Engineering, Computer Science |
| Shah et al. | Twitter | Medicine | Mathematics and computer science |
| Sharma et al. (24) | Instagram | x | Technology |
| Silva et al. (25) | Foursquare | x | Computer Science, Informatics, Geography |
| Sullivan et al. (26) | Amazon | Biomedical Informatics | Biomedical Informatics |
| Sun et al. (27) | Twitter  | x | Computer science, Network computing and security |
| Turner-McGrievy et al.(28) | Twitter | Health Promotion, Exercise Science, RD\* | x |
| Vidal et al. (29) | Twitter | Psychology, Food | x |
| Vydiswaran et al.  | Twitter | Public Health, Nutritional Science\* | Information, Urban planning |
| Widener et al. (31) | Twitter | x | Geography, Geospatial analysis and computation |
| Wombacher et al. (32)  | Twitter | Health  | Communication |
| Yan et al. (33) | Koubei | x | Management Science and Engineering |
| Zhou et al. (34) | Weibo  | x | Information management |

\*Inclusion of a nutritionist or dietitian in the research team. RD is the USA credential for Registered Dietitian

\*\*Studies where author affiliation not clearly identifiable: Fried et al., Mejova et al., Pang et al.

**Table 2C Data chart: Ethical approval, mentions and considerations (alphabetical by first author)**

|  |  |  |
| --- | --- | --- |
| **Study** | **SoMe****Platform(s)** | **Ethics approval or mention** |
| Abbar et al. (1) | Twitter | x |
| Alhabash et al. (2) | Twitter | x |
| Alajaijan et al.  | Twitter  | x |
| Blackstone et al. (4) | Facebook | Approved by the IRB at the researchers’ universities. |
| Carrotte et al. (5) | TwitterFacebookTumblrInstagram | x |
| Cavazos-Rehg et al. (6) | Twitter | The researchers stated: “The Twitter data in this current study are public. Washington University’s Institutional Review Board reviewed our study protocol, and our research received an institutional review board exemption.” |
| Chen et al. (7) | Twitter | x |
| ElTayeby et al. (8) | Facebook group | The researchers stated that: “We deidentified posts…”. |
| Fried et al. (9) | Twitter | x |
| Huang et al. (10) | Twitter | x |
| Karami et al. (12) | Twitter | The researchers stated: “This paper used the real-time method to randomly collect 10% of publicly available English tweets…” |
| Kershaw et al. (11) | Twitter | x |
| Mejova et al. (13) | InstagramFoursquare | x |
| Nguyen et al. (14) | Twitter | x |
| Nguyen et al. (15) | Twitter | The University of Utah Institutional Review Board |
| Nguyen et al. (16) |  | The University of Utah Institutional Review Board |
| Ofli et al. (17) | Instagram | x |
| Pang et al. (18) | Instagram | x |
| Phan et al. (19) | Instagram | x |
| Primack et al. (20) | YouTube | x |
| Rahman et al. (21) | TwitterFoursquare | x |
| Rich et al. (22) | Instagram | x |
| Shah et al. (23) | Twitter | x |
| Sharma et al. (24) | Instagram | x |
| Silva et al. (25) | Foursquare | x |
| Sullivan et al. (26) | Amazon.com reviews | x |
| Sun, et al. (27) | Twitter | x |
| Turner-McGrievy et al. (28) | Twitter | The researchers stated that: “All procedures, including the informed consent process, were conducted in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000”. |
| Vidal et al. (29) | Twitter | *x* |
| Vyidiswaran et al. | Twitter  | University of Michigan Institutional Review Board |
| Widener et al. (31) | Twitter | x |
| Wombacher et al. (32) | Twitter | The researchers stated: “As messages on Twitter are publicly available, it was the most direct method of gathering data…”. |
| Yan et al. (33) | Koubei | x |
| Zhou et al. (34) | Weibo (Chinese) | x |

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