Appendix C: Technical methods

This appendix details the analytical methods employed by The Innovation Group (TIG) in its report. TIG's analysis consisted primarily of the use of gravity model in a gaming market analysis; a return-on-investment analysis to assess different levels of capital investment viable in potential casino locations under alternative tax scenarios; and an economic impact analysis using IMPLAN. The following sections are directly from TIG's

Gaming market analysis methodology

A gravity model was used to develop this analysis. Gravity models are commonly used in location studies for commercial developments, public facilities, and residential developments. First formulated in 1929 and later refined in the 1940s, the gravity model is an analytical tool that defines the behavior of a population based on travel distance and the availability of goods or services at various locations. The general form of the equation is that attraction is directly related to a measure of availability such as square feet and inversely related to the square of the travel distance. Thus the gravity model quantifies the effect of distance on the behavior of a potential patron and considers the impact of competing venues.

The basic formulation is that the interaction between two or more gaming venues is based on Newton's Law of Universal Gravitation: two bodies in the universe attract each other in proportion to the product of their "masses"—here, gaming positions—and inversely as the square distance between them. Thus, expected interaction between gaming venue *i* and market area *j* is shown as:

$$k \times \frac{N_i \times P_j}{d_{ij}^2}$$

where N_i = the number of gaming positions in gaming venue i, P_j = the population (21+) in market area j, d_{ij} = the distance between market area j and gaming venue i, and k = an attraction factor relating to the quality and amenities to be found at each gaming venue in comparison with the competing set of venues. When this formulation is applied to each gaming venue gaming trips generated from any given zip code are then distributed among all the competing venues.

The gravity model included the identification of 36 discrete market areas based on drive times and other geographic features and the competitive environment. Using TIG's GIS software and CLARITAS database[1], the adult population (21 and over), latitude and longitude, and average household income is collected for each zip code.

[1]The GIS software used was MapInfo. This software allows for custom data generally in a tabular format with a geographic identification code (census tract, zip code, latitude and longitude, or similar identifier) to be mapped or displayed and integrated with other geographic census based information such as location of specific population or

Each of these market areas is assigned a unique set of propensity and frequency factors. Gamer visits are then generated from zip codes within each of the areas based on these factors. The gamer visits thus generated are then distributed among the competitors based upon the size of each facility, its attractiveness and the relative distance from the zip code in question. The gravity model then calculates the probabilistic distribution of gamer visits from each market area to each of the gaming locations in the market.

Each travel distance/time is evaluated to determine the likely alternative gaming choices for residents of the region. The model is constructed to include only those alternative venues that are considered to be within a reasonable travel time. These include competing casinos that have the potential to attract patrons, or siphon off visits from the market. Travel distances and time have been developed through use of our GIS system.

The following section provides a description and definition of the various components of the model.

Gamer visits

This measure is used to specify the number of patron trips to a gaming market, where an individual can make any number of separate visits in the course of a year. To estimate the gamer visits, market penetration rates, made up of the separate measures of propensity and frequency, are applied to the adult population in each zip code. A gamer visit can include more than one visit to a casino.

Net gaming revenue (or net win)

Net gaming revenue (NGR) or net win in this report refers to amount wagered (for example, coin-in to a machine) minus prizes awarded (or gross gaming revenue) minus the value of redeemed free play credits. The main existing casino jurisdictions in the Virginia region (Maryland, Pennsylvania, and West Virginia) allow free play credits to be subtracted before gaming taxes are applied, and therefore public reporting of gaming revenue shows NGR, which has been utilized in the model calibration. In other markets, such as Illinois and Iowa, free play is taxed and the public reporting shows gross gaming revenue.

Propensity

Propensity measures the percentage of adults who will participate in casino gaming within the zip code. This varies based upon a number of factors, which includes the number of gaming venues, their type (i.e. land based versus cruising riverboat versus dockside riverboat), games permitted, availability of other entertainment and leisure options, and most importantly—distance from a gaming venue. After proximity, age and income are the most influential factors in propensity, with 35 and older having higher propensity. Surveys conducted by the American Gaming Association have shown that gamers

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roadways. MapInfo is one of the most widely used programs in the geographic information systems industry. Nielsen Claritas is a vendor of demographic information located in the United States. Nielsen Claritas provides census demographic and psychographic data on a variety of geographic levels of detail ranging from census block groups and counties to postal zip codes. Their information is updated every six months and includes a current year estimate and provides a five year forecast for the future. The Innovation Group has utilized this data for inputs to its models for the last six years and has purchased full access to their demographic database for the entire United States.

have higher-than-average income. Propensity is fairly consistent among racial and ethnic groups, although people of Asian origin tend to prefer table gaming. Propensity in the inner market areas from 0-50 miles can vary between the low 30 percent range in a single casino market to the upper-40 percent range, or more in a market like Las Vegas, for multiple casinos with a well-developed array of amenities.

Demographic variability is adjusted at the zip code level with the Market Potential Index (MPI) score that is discussed below. The propensity rates shown in this report reflect drive-time proximity and other supply issues (such as games permitted—for example, in Scenario 1, gaming is limited to HHR machines—and capacity constraints).

Frequency

This measures the average number of visits that an adult will make annually to casinos in the subject market. Frequency is a function of annual gaming budget as indicated by income variations, the number of venues in the market, the type of gaming facility, and most importantly distance from a gaming venue.

MPI (market potential index)

Propensity also varies as a function of each market's average market potential index (MPI) score. MPI scores are generated by Simmons Survey, a respected consumer research firm that conducts a nationwide survey of consumer behavior, including propensity to gamble at a casino. This score is an indication of the degree of likelihood that a person will participate in gaming based upon their lifestyle type. The MPI score inflates or discounts the participation rate of each zip code. For example, if a market area has an overall participation rate of 4.0 (propensity of 40 percent times frequency of 10), an MPI score of 120 for a particular zip code would effectively inflate the participation rate of that zip code to 4.8 (4.0 times 120 percent). The overall MPI score for the market area is a weighted average of all the zip codes within the area.

Win per visit

Win per visit varies not only by gaming jurisdiction, but also in some cases by individual facilities. Normatively, win per visit is a function of distance and income. Gamers traveling greater distances tend to spend more per visit, typically making fewer gamer visits on average.

Attraction factors

Attraction factors measure the relative attraction of one gaming venue in relation to others in the market. Attraction factors are applied to the size of the gaming venue as measured by the number of positions it has in the market. Positions are defined as the number of gaming machines plus the number of seats at gaming tables. A normative attraction factor would be one. When this is applied to the number of positions in a gaming venue there is no change in the size of the gaming venue as calculated by the model and hence its attraction to potential patrons. A value of less than one adjusts the size of the gaming venue downwards and conversely a value greater than one indicates that the gaming venue has characteristics that make it more attractive. Attraction factors can be based on a

number of components including branding, the level and effectiveness of marketing efforts, and the level of quality and amenities of a facility. Attraction factors are also adjusted to model the presence of natural and man-made boundaries which impact ease of access and convenience of travel in the market area.

The model's sensitivity to changes in these factors is not in the nature of a direct multiplication. For example, a doubling of the attraction factor will not lead to a doubling of the gamer visits attracted to the site. It will however cause a doubling of the attractive power of the gaming venue, which is then translated via non-linear equations into an increase in the number of gamer visits attracted to the gaming venue. This is based upon the location, size, and number of competing gaming venues and their relationship to the market area to which the equation is applied. The variation of these factors is based upon The Innovation Group's experience in developing and applying these models, and consideration of the existing visitation and revenues. The latter represents the calibration of the model and has been accomplished by adjusting attraction factors to force the model to recreate the existing revenues and patron counts. In this case attraction factors have been adjusted for each casino for each market area. This is based upon known visitation patterns.

Out-of-market visitation and revenue

In addition to the local market revenue generated through the gravity model, casinos generate visitation and revenue from gamers from outside of a defined local market area. This out-of-market gaming demand represents visits driven by reasons other than proximity of permanent residence, such as traffic intercept, tourism, visiting friends and family, seasonal residence, and variety of gaming experience. This typically ranges between 4 percent and 10 percent of a casino's revenue depending upon location and the strength of the tourism market relative to the size of the local population.

Market carve-out

Virginia's expanded gaming market has been carved into 36 distinct market areas, from which different participation rates may be expected depending on the level and location of competition that is present in the market currently and in the future. The following table and map show the market areas and their respective adult population (21 and over) and average household income (Table C-1 and Figure C-1).

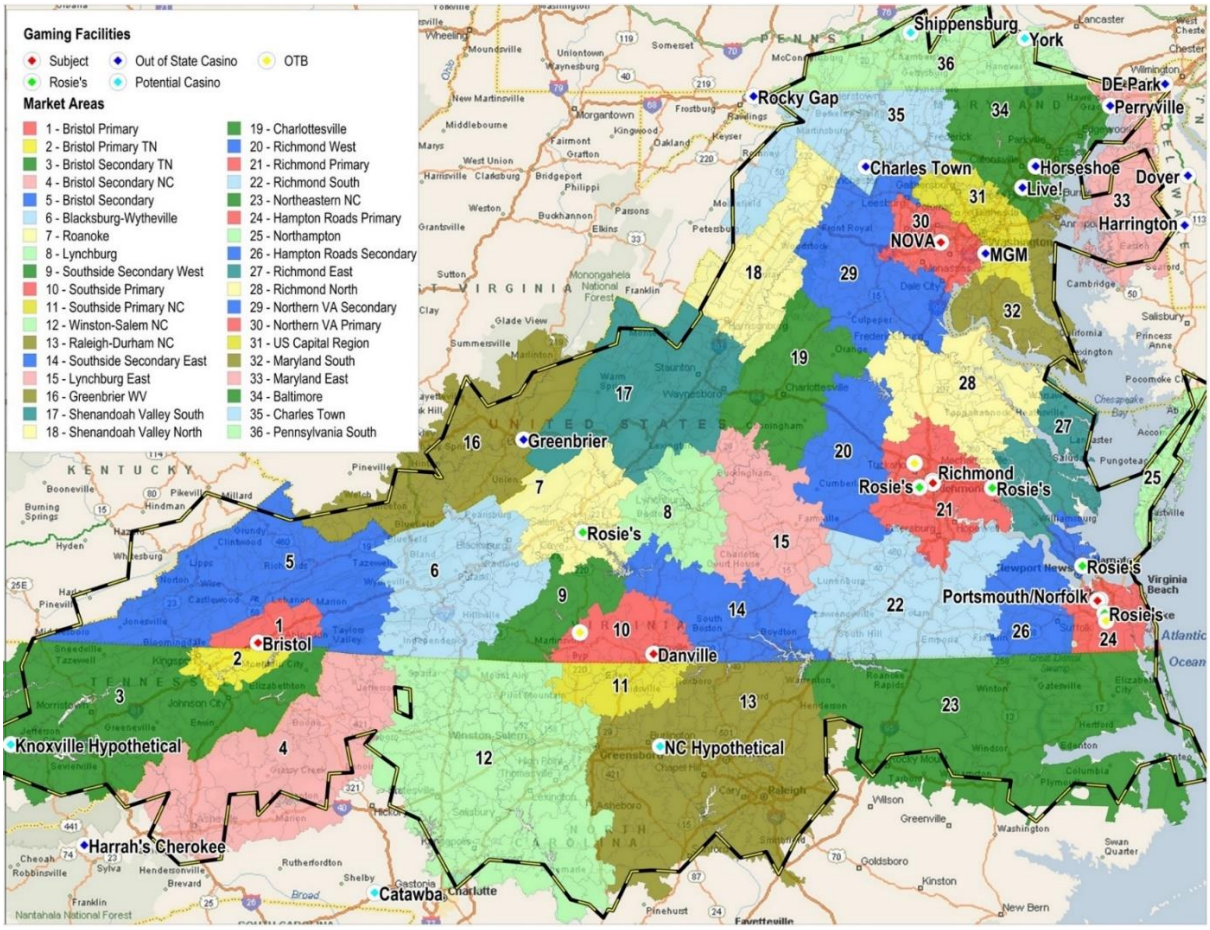
TABLE C-1

Market-area demographics

	Adult Pop 2019	Adult Pop 2024	CAGR 2019-2024	Average HHI[a] 2019	Average HHI 2024	CAGR 2019-2024
1 - Bristol primary	52,943	53,611	0.3%	$64,504	$68,149	1.1%
2 - Bristol primary (TN)	142,000	146,514	0.6	65,258	69,601	1.3
3 - Bristol secondary (TN)	791,008	824,980	0.8	62,764	68,991	1.9
4 - Bristol secondary (NC)	463,354	486,949	1.0	66,640	74,585	2.3
5 - Bristol secondary	180,257	178,157	-0.2	52,667	54,355	0.6
6 - Blacksburg-Wytheville	192,992	198,819	0.6	69,519	76,706	2.0
7 - Roanoke	230,541	237,283	0.6	72,297	76,172	1.0
8 - Lynchburg	160,702	166,833	0.8	69,723	74,071	1.2
9 – Southside - secondary west	54,423	55,198	0.3	60,760	66,295	1.8
10 - Southside - primary	107,053	107,041	0.0	58,017	63,832	1.9
11 - Southside - primary (NC)	78,601	79,843	0.3	52,803	56,056	1.2
12 - Winston-Salem, NC	1,540,174	1,637,102	1.2	78,470	87,405	2.2
13 - Raleigh-Durham, NC	1,809,372	1,956,990	1.6	91,363	101,842	2.2
14 - Southside - secondary east	59,357	59,668	0.1	58,147	63,276	1.7
15 - Lynchburg - east	55,950	56,628	0.2	59,885	65,182	1.7
16 – Greenbrier, WV	113,872	111,445	-0.4	54,027	56,459	0.9
17 - Shenandoah Valley - south	162,267	166,549	0.5	69,169	73,465	1.2
18 - Shenandoah Valley - north	218,205	229,498	1.0	80,020	88,415	2.0
19 - Charlottesville	188,794	198,607	1.0	96,483	103,407	1.4
20 - Richmond - west	76,337	79,497	0.8	85,812	90,472	1.1
21 - Richmond primary	848,949	895,703	1.1	94,220	102,814	1.8
22 - Richmond - south	90,809	90,995	0.0	62,007	66,776	1.5
23 - Northeastern NC	333,788	339,082	0.3	60,976	65,948	1.6
24 - Hampton Roads primary	903,688	928,602	0.5	87,027	96,263	2.0
25 - Northampton	33,319	33,308	0.0	60,690	64,213	1.1
26 - Hampton Roads secondary	253,747	260,649	0.5	86,747	94,025	1.6
27 - Richmond - east	146,087	152,715	0.9	98,096	106,839	1.7
28 - Richmond – north	199,370	210,268	1.1	99,076	108,296	1.8
29 - Northern VA - secondary	442,337	477,582	1.5	133,824	142,956	1.3
30 - Northern VA primary	1,645,233	1,742,226	1.2	160,724	170,004	1.1
31 - US Capital Region	2,012,324	2,111,071	1.0	131,277	141,998	1.6
32 – Maryland - south	401,821	422,578	1.0	129,023	139,144	1.5
33 - Maryland - east	183,443	188,757	0.6	97,204	105,769	1.7
34 - Baltimore	1,925,148	1,981,209	0.6	111,346	124,929	2.3
35 - Charles Town, WV	444,209	465,292	0.9	96,486	105,745	1.8
36 - Pennsylvania - south	549,525	563,423	0.5	82,274	90,651	2.0
Total	**17,091,999**	**17,894,672**	**0.9%**	**$100,214**	**$109,544**	**1.8%**
Virginia total	*6,303,830*	*6,579,859*	*0.9*	*105,163*	*113,367*	*1.5*
National	*241,443,147*	*251,847,827*	*0.8*	*89,646*	*98,974*	*2.0*

SOURCE: iXPRESS, Nielsen Claritas, Inc.; MapInfo: The Innovation Group; CAGR=Compound annual growth rate.
NOTE: [a] Household income.

FIGURE C-1
Virginia Market Area Definitions and 2-Hour* Drive time Ring (*from a VA HHR or potential casino location)



SOURCE: The Innovation Group
NOTE: See online version of report for better differentiation between color coding of regions.

Model calibration

The gravity model was calibrated for 2018–2019 using publicly reported data from state gaming commissions. Competitive casinos were input into the model as discussed in the competitive environment section [of TIG's report]. The following table shows the rates for propensity, frequency, and win per visit by market area that were used to re-create the actual conditions in the Base 2018–2019 model. Win has been varied based on differences between market areas in average household income and travel time. These gaming visits and revenues reflect the total gaming revenue from the defined market area in the last 12 months.

As discussed above in the methodology section, gaming revenue is shown as net gaming revenue (NGR, or net of free play promotional credits) consistent with public reporting in Maryland, Pennsylvania, and West Virginia.

Table C-2 shows the results of the calibration model, which is based on the existing casino competition in the broad region as discussed in the competitive environment chapter above and the NGR generated in the 12-month period of April 2018 through March 2019, which was the latest month available at the time the analysis was being set up. As such, it reflects conditions prior to any gaming in Virginia and excludes the Virginia HHR facilities (Rosie's) that have recently opened. It represents gaming spend by residents of the defined market areas at existing casinos discussed in the Competitive Environment section [of TIG's report]

TABLE C-2
Local Market Gravity Model Calibration Base last 12 months (through March 2019)

	Gamer Pop	Propensity	Frequency	MPI	Visits	WPV	NGR (MMs)
1 - Bristol primary	52,943	10.3%	1.1	79	4,711	88	$0.4
2 - Bristol primary (TN)	142,000	12.8	1.7	83	25,957	88	2.3
3 - Bristol secondary (TN)	791,008	24.3	4.2	84	668,192	82	55.0
4 - Bristol secondary (NC)	463,354	21.6	3.3	83	269,138	86	23.1
5 - Bristol secondary	180,257	9.2	0.9	70	10,072	83	0.8
6 - Blacksburg-Wytheville	192,992	12.8	2.1	82	43,401	90	3.9
7 - Roanoke	230,541	20.6	4.5	91	195,924	87	17.1
8 - Lynchburg	160,702	15.7	2.6	88	57,617	89	5.1
9 - Southside- secondary west	54,423	13.6	1.9	74	10,588	86	0.9
10 - Southside primary	107,053	4.0	0.2	77	539	86	0.0
11 - Southside primary (NC)	78,601	4.7	0.2	75	605	83	0.1
12 - Winston-Salem, NC	1,540,174	11.5	0.9	91	146,336	96	14.0
13 - Raleigh-Durham, NC	1,809,372	6.0	0.2	96	25,557	103	2.6
14 - Southside - secondary east	59,357	5.0	0.3	71	534	86	0.0
15 - Lynchburg - east	55,950	7.6	0.6	74	1,900	86	0.2
16 – Greenbrier, WV	113,872	22.4	5.3	70	96,148	77	7.4
17 - Shenandoah Valley - south	162,267	14.1	2.6	84	50,881	89	4.5
18 - Shenandoah Valley - north	218,205	20.1	4.3	90	168,249	92	15.4
19 - Charlottesville	188,794	12.9	1.7	94	40,087	104	4.2
20 - Richmond - west	76,337	13.0	1.8	87	15,339	99	1.5
21 - Richmond primary	848,949	14.9	2.3	100	293,987	102	30.0
22 - Richmond South	90,809	9.1	0.9	75	5,332	87	0.5
23 - Northeastern NC	333,788	5.3	0.3	78	3,840	87	0.3
24 - Hampton Roads primary	781,377	8.2	0.7	110	48,486	102	4.9
25 – Northampton	33,319	18.7	3.7	69	15,968	83	1.3
26 - Hampton Roads secondary	376,058	8.8	0.8	98	25,818	97	2.5
27 - Richmond - east	146,087	11.3	1.3	91	20,106	105	2.1
28 - Richmond - north	199,370	18.4	3.6	97	126,398	102	12.9
29 - Northern VA - secondary	442,337	21.7	5.0	106	512,298	116	59.2
30 - Northern VA - primary	1,645,233	24.2	7.9	110	3,442,890	121	416.1
31 - US Capital Region	2,012,324	30.0	9.7	110	6,436,889	99	640.0
32 - Maryland - south	401,821	24.7	6.5	106	685,839	109	74.8
33 - Maryland - east	183,443	28.5	8.3	94	410,238	89	36.6
34 - Baltimore	1,925,148	30.4	9.9	112	6,468,294	90	584.7
35 - Charles Town, WV	444,209	26.7	7.6	98	885,799	91	80.7
36 - Pennsylvania - south	549,525	22.5%	5.4	96	642,057	90	58.0
Total	**17,091,999**				**21,856,012**	**99**	**$2,163.3**

SOURCE: The Innovation Group; WPV=Casino Win per Visit; NGR=Net Gaming Revenue; LTM = Last 12 Months

Forecast scenarios

The impact of potential casino development is measured on a future baseline year of 2025, which is estimated to be the first stabilized year of casino operation and the second full year of operation, given the following assumptions for development timeline:

- November 2020: Casino ballot initiatives

- 2021: Casino licensing process
- 2022-2023: Construction of casino facilities
- 2024: Opening of casino facilities

TIG conducted assessments for the following scenarios:

- Scenario 1: HHR Benchmark (five facilities totaling 2,850 machines, as discussed below). HHR has been approved by the Commonwealth (and implemented at three locations already), and HHR is therefore an assumed competitor in all scenarios.
- Scenario 2: Baseline Casino Development (five casinos as mentioned in the current legislation: Bristol, Danville, Norfolk, Portsmouth and Richmond) competing with the HHR facilities.
- Scenario 2a: North Carolina and Tennessee Sensitivity Analysis (testing the impact of hypothetical new casino development in these two states on Bristol and Danville).
- Scenario 3: Northern Virginia (NOVA) alternative. This scenario adds a casino in NOVA to the Scenario 2 assumptions.

TIG used realistically conservative assumptions throughout the modeling process. For the gravity modeling we assumed a mid-range gaming tax of 27 percent, and to simplify the analysis we have assumed a blended rate. Many states—including in the mid-Atlantic region—have higher tax rates for slot machines than for tables, in recognition of the higher labor expense needed for the operation of table games. However, the 27 percent blended rate is competitive with the actual blended rate in other mid-Atlantic states.

Return-on-Investment (ROI) analysis

A high-level ROI analysis was conducted for the five-plus-one casino locations to identify the different levels of capital investment that would be viable under the alternative tax scenarios. Given the small marginal impact by NOVA on the five base casino locations, the ROI analysis utilized the Scenario 2 forecasts for Bristol, Danville, Norfolk, Portsmouth and Richmond and the Scenario 3 results for NOVA.

Methodology

The first step in the ROI process was to complete operating pro formas for each location under the alternative tax scenarios. The operating pro formas were developed using TIG's proprietary operating model and is based on operating characteristics of comparable properties in the region. It also takes into consideration existing and assumed future market dynamics and the major assumptions addressed in previous sections of this report. It is a dynamic model built on a foundation of staffing and expense estimates relative to facility size and business volume, whereby changes to the facility or business volume flow through the model to estimate how variable expenses will be affected. The outputs of the operating model include employment and employee compensation (wages, salaries, tips, taxes and benefits), gaming taxes, other casino expenses, and earnings before interest, taxes, depreciation, and amortization (EBITDA).

The ROI analysis used a discounted cash flow analysis (DCF), which uses unlevered cash flow (a company's cash flow before interest payments). A DCF analysis adjusts for the time value of money in estimating the value of an investment. NPV (net present value) is a comparison of a dollar today to a projected value for the same dollar at some point in the future or the past.

To adjust for the time value of money, a DCF analysis uses a weighted average cost of capital (WACC) or discount rate. Companies and projects are financed by a combination of debt and equity. There is a cost of using this capital, so investors and companies try to earn returns in excess of this cost. This cost—the WACC—corresponds to the weighted average cost, expressed as a percentage, of the various means of financing (loans, equity, etc.) available to fund an investment project. A higher WACC or discount rate results in a lower NPV.

The first step in identifying cash flow is to arrive at a figure for EBIT (earnings before interest and taxes). TIG began with the incremental EBITDA for the five forecasted years and applied a growth rate of 1.5 percent through year 10. EBIT was calculated subtracting the following from EBITDA:

- depreciation[2] as calculated from building cost, FF&E, and maintenance cap ex;
- amortization[3].

Next, EBIT is adjusted to derive unlevered cash flow, which is calculated as follows:

EBIT:
Less: unlevered taxes (at 27 percent)[4]
Plus: depreciation
Less: maintenance capex
= unlevered cash flow

Construction costs, including fixtures, furnishings, and equipment (FF&E) were estimated on a square-foot and per-unit basis. Building costs were depreciated over 20 years; FF&E costs were depreciated over seven years. Other development costs were included in the ROI analysis, including architectural and engineering, permits and site work, land costs, regulatory application fee, working capital, and pre-opening costs.

The analysis also includes an allowance for maintenance capital expenditures. This reflects the need, which grows greater as a property ages and experiences wear and tear, to replace FF&E and in general maintain the facility. Maintenance capex is typically calculated as a percentage of total revenues; in the present analysis a capex allowance of 0.5 percent is applied to incremental revenue in year two, gradually rising to 3.5 percent by year six.

[2] Depreciation is the deduction over a specific period of time (usually over the asset's life) of the consumption of the value of tangible assets, including in this case the building cost and furnishings, fixtures and equipment.
[3] Amortization is the deduction over a specific period of time (usually over the asset's life) of the consumption of the value of an intangible asset, such as a patent or a copyright. It was not utilized in this analysis.
[4] Federal plus Virginia state corporate income tax

Unlevered cash flow through year 10 was then applied to the DCF analysis. In addition, standard methodology is to assess a terminal value to reflect the value the property would continue to have beyond the forecast period. TIG used the Gordon Model: value equals to cash flow divided by discount rate (k) minus a long-term or perpetual growth rate (*g*), "V=CF/(k-g)". Terminal CF is calculated as year 10 cash flow times 1+g. The value for *g* (the perpetual growth rate) has been set at 1.5 percent.

The following table shows an illustrative example of the DCF analysis using the NOVA location under the 27 percent tax scenario:

Table C-3
NPV Cash Flow Illustration: NOVA 27% (MM)

Year>	Year One	Year Two	Year Three	Year Four	Year Five	Year Six	Year Seven	Year Eight	Year Nine	Year Ten	Terminal	*Total*
EBITDA	$225.7	$246.6	$255.5	$262.7	$270.2	$275.6	$281.1	$286.7	$292.4	$298.3		
EBIT	181.1	201.6	210.2	217.1	223.7	228.4	233.8	264.8	270.5	276.3		
Less: unlevered taxes	(48.9)	(54.4)	(56.8)	(58.6)	(60.4)	(61.7)	(63.1)	(71.5)	(73.0)	(74.6)		
Plus: Depreciation	44.6	45.0	45.3	45.7	46.4	47.2	47.2	21.9	21.9	22.0		
Less: Maintenance capex	0.0	(3.3)	(6.8)	(10.5)	(18.0)	(25.7)	(26.2)	(26.7)	(27.2)	(27.8)		
Unlevered cash flow	176.8	188.8	191.9	193.6	191.8	188.2	191.8	188.5	192.2	195.9	1,807.6	
NPV factor	88.9%	79.0%	70.2%	62.4%	55.5%	49.3%	43.8%	39.0%	34.6%	30.8%		
NPV of cash flow	**$157.16**	**$149.18**	**$134.80**	**$120.87**	**$106.42**	**$92.85**	**$84.08**	**$73.46**	**$66.57**	**$60.33**	**$556.65**	***$1,602.4***

SOURCE: The Innovation Group; NPV: net present value

Enterprise value (EV) includes the value of debt, which would need to be paid by a willing buyer. Therefore, the development costs need to be subtracted from EV to determine residual equity value (or ***net*** present value), which represents the fair market value in a DCF valuation. In other words, the NPV line represents the present value of cash flows, minus the cost of development or capital outlay. A positive NPV value indicates a project is generally worth pursuing.

Table C-4
ROI Illustration: NOVA 27% (MM)

Discount rate	12.50%
Perpetual growth rate	1.50%
Enterprise value (present value of cash flows)	1,602.4
Less: project debt & equity	(672.5)
Net present value (NPV) of project*	929.9
Cash-on-cash return in year 5	28.5%

SOURCE: The Innovation Group; *Also known as residual equity value

The cash-on-cash return is commonly used as a basis for determining the return rate of a real estate investment or transaction. This calculation determines the cash income on the cash invested. TIG

calculated the cash-on-cash return rate for the project by utilizing the capital outlay as the denominator, and a numerator taken from year five unlevered cash flow.

Cash-on-cash expectations can vary by company, and in the gaming industry they can fluctuate with economic conditions and investment returns available elsewhere. From the mid-1990s but prior to the Great Recession, when there was dramatic growth in the gaming industry, investor expectations ranged from 20 to more than 25 percent. In the immediate aftermath of the recession, expectations tempered, and returns dropped to the 10 to 15 percent range as gaming revenue in established jurisdictions remained relatively flat into 2014. As normative growth has resumed in the industry, return expectations have started to rise again, into the 15 to 20 percent range.

Economic impact analysis

Economic impact analyses are commonly used tools to estimate the economic activity that results from the opening or closure of a business or industry to an area. In this section, TIG assesses the economic impacts resulting from the projected changes in business volume (as measured in revenue) and employment due to legalized gambling in the state.

TIG performed the analysis using IMPLAN data and software, a leading supplier of economic impact data and software used and relied on by thousands of private developers and government agencies.

Methodology

The economic benefits—the revenues, jobs, and earnings—that accrue from the annual operations of an enterprise are termed ***ongoing*** impacts. The construction phase of a project is considered a ***one-time*** benefit to an area. This refers to the fact that these dollars will be introduced into the economy only during construction; construction impacts are expressed in single-year equivalence to be consistent in presentation with ongoing annual impacts.

- The economic impact of an industry consists of three layers of impacts:direct effects,
- indirect effects, and
- induced effects

The **direct effect** is the economic activity that occurs within the industry itself. The direct effect for casino operations represents the expenditures made by the facility in the form of employee compensation and purchases of goods and services (direct expenditures), which ultimately derive from patron spending on the casino floor, and patron spending on non-gaming amenities is an additional direct effect.

Indirect effects are the impact of the direct expenditures on other business sectors: for example, the advertising firm who handles a casino's local media marketing. Indirect effects reflect the economic spin off that is made possible by the direct purchases of a casino. Firms providing goods and services to a casino have incomes partially attributable to the casino.

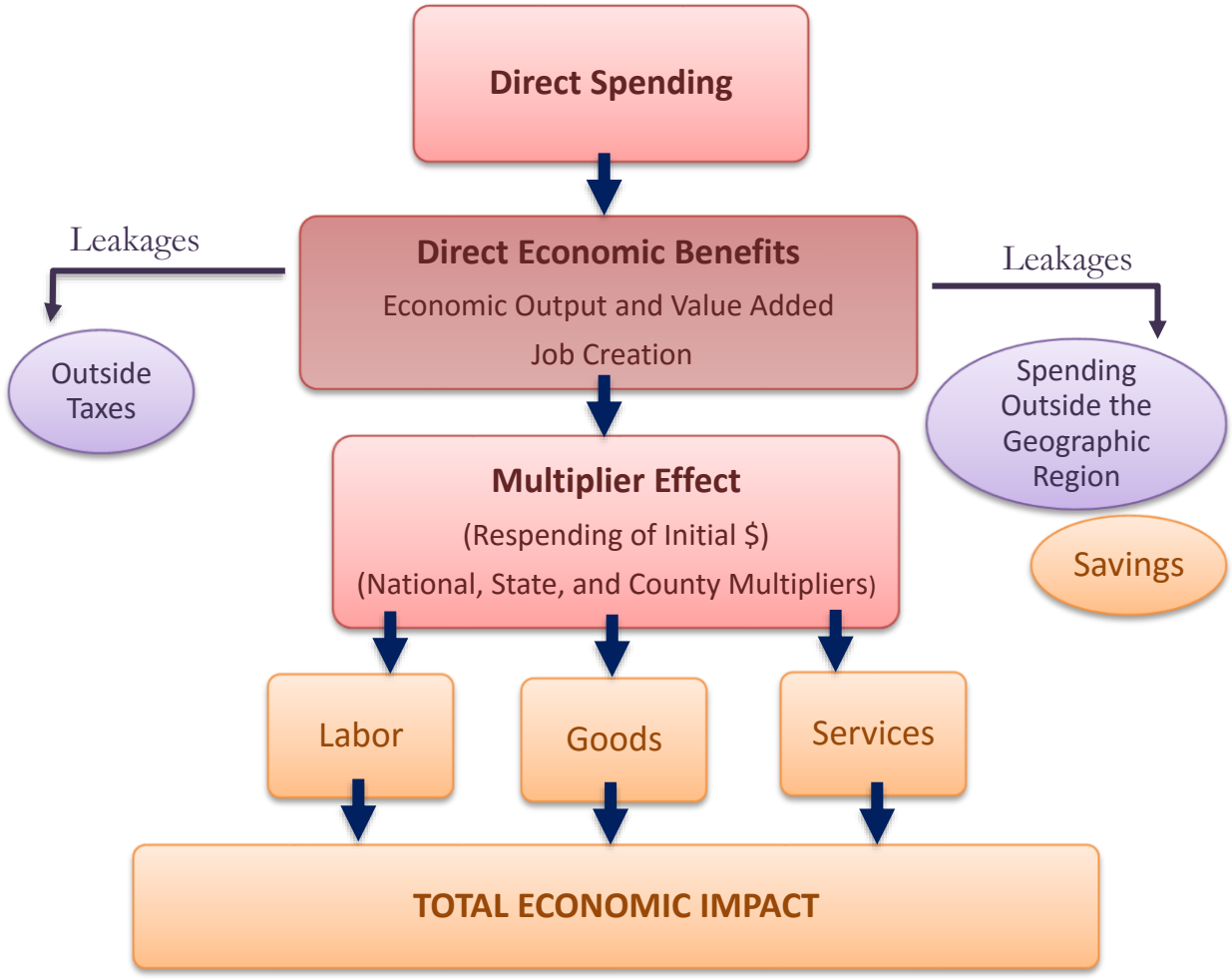
Finally, the **induced effects** result from the spending of labor income: for example, casino employees using their income to purchase consumer goods locally. As household incomes are affected by direct employment and spending, this money is recirculated through the household spending patterns causing further local economic activity.

The **total** economic impact of an industry is the sum of the three components.

Determining the direct economic impact is a critical first step in conducting a valid economic impact analysis. Once the direct expenditures are identified, the indirect and induced effects are calculated using multipliers derived from an input-output model[5] of the economy. The IMPLAN input-output model identifies the relationships between various industries. The model is then used to estimate the effects of expenditures by one industry on other industries so that the total impact can be determined. Industry multipliers are developed based on U.S. Census data. IMPLAN accounts closely follow the accounting conventions used in the "Input-Output Study of the U.S. Economy" by the Bureau of Economic Analysis.

The following flow-chart shows how the economic impact model operates.

Figure C-2
Economic impact model

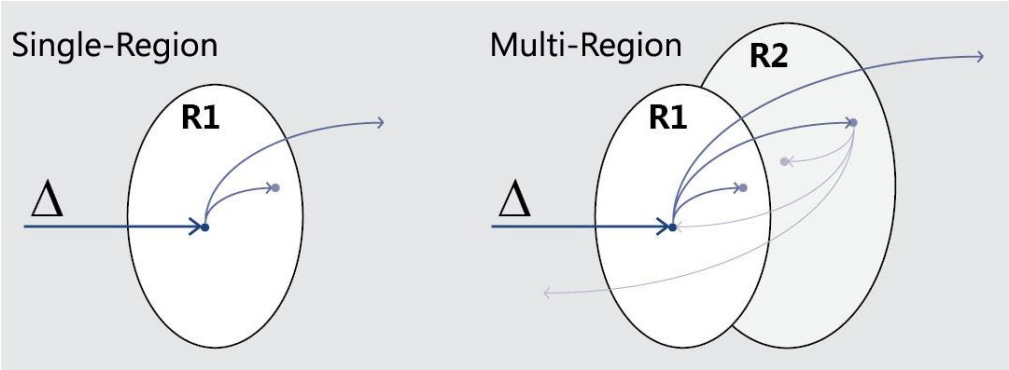


[5] IMPLAN 3.1 software and data were utilized for this study.

SOURCE: The Innovation Group

Given the number of counties and cities that would be affected by the potential changes, TIG relied on the multi-regional input-output (MRIO) analysis method available in the IMPLAN Pro 3.1 software. In this process, TIG entered the direct spending associated with the construction and operation of the facility into a study area model. For this analysis, there are five study area models each comprising the local jurisdiction hosting a gaming facility and surrounding jurisdictions within the region. Then, the regional model is linked to a model of all remaining jurisdictions within the state. This allows our analysis to capture impacts from purchases and employment that would have otherwise occurred outside the study area but within Virginia. IMPLAN models estimate the additional impact using existing trade flow patterns and data on each industry's supply chain, identifying linkages between industries from one region to another.

Figure C-3



SOURCE: The Innovation Group

Our analysis of these linked models yields direct, indirect, and induced effects for the study area, as well as indirect and induced effects for the balance of the state; direct effects occur *only* in the study area as all purchases and employment associated with construction, employment, and operations occur there. The multi-regional analysis thus results in impacts for the study area (host region) and the rest of Virginia (termed "rest of state" in the table headings in this report).

The following map identifies the counties in each of the five regional models used for the analysis.

Appendix F: Lottery, Charitable Gaming, and Horse Racing in Virginia

While most forms of gaming are illegal in Virginia, statute currently authorizes three forms of gaming: state-run lottery, charitable gaming, and horse racing wagering. Each of these three forms of gambling are governed by a different body and overseen by a different state agency.

Virginia Lottery

The Virginia Lottery was established in 1987 to generate funds for Virginia's K–12 public education system. The Virginia Lottery is governed and regulated by the Virginia Lottery Board, composed of five members appointed by the governor. The Code of Virginia established the Virginia Lottery as an independent agency of state government responsible for operating a gaming industry within the confines of state statute.

The Virginia Lottery offers games of chance for sale across the Commonwealth. Virginia lottery products are sold statewide by licensed sales agents. Although the Virginia Lottery is not permitted to sell lottery tickets to consumers over the internet, it does offer an online prepaid subscription service for the purchase of some lottery tickets, such as daily drawings and multi-state jackpot games. Additionally, in April 2019, the Virginia Lottery introduced "Mobile Play," a digital platform that allows players to purchase some games through a smart phone application that connects to a lottery sales terminal via Bluetooth when the player is physically located on the premises of a licensed lottery retailer.

The Virginia Lottery has traditionally sold three main types of products: daily draw games, scratch-off tickets, and multi-state jackpot games. The introduction of the Mobile Play app has allowed the lottery to introduce a fourth type of product, e-games (Table F-1).

TABLE F-1
Lottery products in the Commonwealth

Lottery product types	Description	Cost per ticket	Examples
Daily draw games	Players purchase a lottery ticket with a combination of numbers. Drawings are held on a daily basis to determine winning number combinations	0.25 - 1	Cash 5, Pick 4, Pick 3
Scratchers, scratch-offs, or instant tickets	Lottery ticket where player scratches off a latex coating revealing letter, numbers or symbols, indicating if the player won	1 - 30	Triple Your Money, Weekly Grand, Combo Play
Multi-state jackpot games	Lottery games offered in multiple jurisdictions to allow for larger prizes	2	Powerball, Mega Millions, Cash4Life
E-games via MobilePlay	Lottery games purchased for immediate play on a smartphone device	0.50 - 10	Tropical 8s, Bop Dice, Lucky Falls

SOURCE: North American Association of State and Provincial Lotteries, "Glossary of Lottery Terms." Virginia Lottery.
NOTE: Virginia Lottery offers an online prepaid subscription service for the purchase of some lottery tickets such as daily drawings and multi-state jackpot games.

The Virginia Lottery Board governs the operations of the state lottery

The Virginia Lottery Board is composed of five members appointed by and serving at the pleasure of the governor. Statute does not require that Lottery Board members have any specific background, but it does require that members provide a public official surety bond prior to serving on the board. This type of bond provides a financial guarantee that a public official will perform his or her duties faithfully and honestly.

The Lottery Board is a policy board that is vested with the authority to adopt regulations governing the establishment and operation of the Virginia Lottery. Statute directs the board to adopt regulations specifying the types of games conducted, price of tickets, numbers and sizes of prizes, odds of winning, proportion of revenues disbursed as prizes versus returned to the Commonwealth, how winners are selected, how prizes will be paid to winners, the frequency of drawings, types of locations where tickets are sold, ticket sales methods, advertisement methods, how sales agents will be licensed, amount and type of compensation paid to sales agents, and any other matters related to the operation and administration of the lottery.

Procedurally, the Lottery Board is subject to the Virginia Administrative Process Act for the process used to adopt regulations. The Virginia Administrative Process Act sets out steps and timelines that Virginia agencies and their governing boards are required to use for establishing and adopting regulations. The Virginia Lottery's existing regulatory framework addresses three topics: (1) administrative processes used by the Board and agency, (2) licensing lottery sales agents, and (3) lottery game rules (Table F-2).

Table F-2
Virginia Lottery regulatory topic areas

Administrative processes used by the board and agency	How the Lottery Board will conduct its business, including conducting meetings, appointing subcommittees, and hearing appeals to licensure decisions.
Licensing lottery sales agents	Eligibility requirements, application procedures, licensure standards, bonding requirements, license fees, licensee standards of conduct, licensee conduct, inspections, financial processes, audits, and license termination.
Lottery game rules	Detailed rules regarding lottery games, their prizes, odds of winning, prices for games, how and when games are sold, how prizes are claimed, and unclaimed prizes.

SOURCE: North American Association of State and Provincial Lotteries, "Glossary of Lottery Terms." Virginia Lottery.

The Virginia Lottery is an independent agency of state government funded by lottery proceeds

The Code of Virginia establishes the Virginia Lottery as an independent agency of state government, which is exclusive of the legislative, executive, or judicial branches of government. Although the lottery is established as an independent agency, the agency director and board members are appointed by and serve at the pleasure of the governor. Statute requires that any candidate for director of the Virginia Lottery undergo a thorough background investigation by the Virginia State Police and post a public official surety bond.

As opposed to the other Virginia gaming agencies that are regulating a gaming industry, the Virginia Lottery is running a state-operated gaming industry, within the confines of state statutes. The lottery's

activities are fundamentally different from the activities of the Virginia Racing Commission (VRC) and Office of Charitable and Regulatory Programs (OCRP). VRC and OCRP license and oversee organizations and individuals that participate in legal gaming activity through either horse race wagering or charitable gaming. The lottery is operating its own gaming activity through developing, selling, and administering lottery games.

The Virginia Lottery is a large state agency that is authorized to employ up to 308 full-time employees. As a large state agency, the lottery has functional areas that are typically found in state agencies, such as administration, finance, and information technology. In addition, the lottery has large functional areas responsible for running the business of the lottery, which include sales, marketing, and digital. Because of the sensitive nature of the lottery business and the large quantities of money involved, lottery has several areas dedicated to audits and security, including an internal audits unit, an investigations unit, an information security unit, and a security operations unit.

The lottery agency's operations are funded from lottery proceeds. The cost of lottery operations, excluding sales agent compensation, may not exceed 10 percent of the total annual estimated gross revenues generated by sales. Even though lottery's operations are funded by the proceeds it generates, as a state agency, lottery still receives a budget appropriation to authorize its annual spending. The lottery's appropriated budget for FY18 was $99.6 million in FY18.

Charitable gaming in the Commonwealth

Charitable gaming is permitted in the Commonwealth to raise funds to support qualified charitable organizations. Charitable gaming is governed by the Charitable Gaming Board and regulated by the Office of Charitable and Regulatory Programs (OCRP) at the Virginia Department of Agriculture and Consumer Services (VDACS). Statute limits the types of games that organizations may offer for charitable gaming to bingo, electronic bingo devices, instant bingo, seal cards, paper or electronic pull tabs, network bingo, or raffles (Table F-3).

TABLE F-3
Types of charitable games permitted in the Commonwealth

Bingo	A game of chance played with individual cards having randomly numbered squares ranging from 1 to 75
Electronic bingo devices	Computer devices that bingo players can use to play many bingo cards at one time. Device can allow for manual or automaticl daubs (stamps) on bingo cards as numbers are called.
Instant bingo, seal cards, or paper pull tabs	Game of chance played by the random selection of one or more individually prepacked cards with winners determined by the preprinted appearance of concealed letters, numbers, or symbols
Network bingo	Specific bingo game in which the purchase of a network bingo card by a player automatically includes the player in a pool with all other players in the network and where the prize is awarded based on a percentage of the total amount of network bingo cards sold
Raffles	Lottery in which a prize is won by a random drawing
Stand-alone electronic pull tabs	Game of chance played by the random selection of one or more pull tabs on a screen with winning determined by the predetermined appearance of concealed letters, numbers, or symbols. These devices are in a stand-alone cabinet and may resemble a traditional slot machine.
Handheld electronic pull tabs	Game of chance played by the random selection of one or more pull tabs on a screen with winning determined by the predetermined appearance of concealed letters, numbers, or symbols. These devices are in a handheld tablets and the games may resemble slot machine type games.

SOURCE: Code of Virginia §18.2-340.22

The Virginia General Assembly first authorized charitable organizations to conduct bingos and raffles in 1973. Prior to that time, gambling was prohibited in the Commonwealth. Local governments were authorized to regulate charitable gaming activities until 1996. Because of a series of allegations of wrongdoing in the early 1990s, the General Assembly established a state Charitable Gaming Commission which began state oversight of charitable gaming on July 1, 1996. In response to a JLARC study and findings, the General Assembly eliminated the Charitable Gaming Commission and established a Department of Charitable Gaming with a policy board, the Charitable Gaming Board, effective July 1, 2003. In 2008, the General Assembly incorporated the Department of Charitable Gaming into the Virginia Department of Agriculture and Consumer Services, and maintained the Charitable Gaming Board.

The Charitable Gaming Board oversees charitable gaming

Statute vests the Charitable Gaming Board with the power to promulgate regulations relating to charitable gaming, and vests VDACS with the control of charitable gaming. Statutes and regulations limit the types of organizations that may conduct games, when games may be conducted, how frequently organizations may conduct games, how games are conducted, and where games are conducted.

The Charitable Gaming Board consists of 11 members—six members appointed by the governor, three members appointed by the Speaker of the House of Delegates, and two members appointed by the Senate Committee on Rules. Statute sets out background requirements for each seat on the

Charitable Gaming Board. These requirements ensure that the board is made up of individuals with experience belonging to organizations that conduct charitable gaming, individuals who supply charitable organizations with gaming equipment, individuals who own, lease, or rent property used for charitable gaming, and law enforcement. Finally, five seats must be occupied by individuals who do not have any interest in charitable gaming.

The Charitable Gaming Board is considered a policy board because it is specifically charged by statute to promulgate regulations and advise the OCRP; however, the board is not responsible for supervising the OCRP or employing personnel. In addition to promulgating charitable gaming regulations, statute also directs the board to advise OCRP on the conduct of charitable gaming and recommend statutory changes as necessary.

OCRP staff conduct day-to-day administration of charitable gaming

OCRP is a unit within the Virginia Department of Agriculture and Consumer Services (VDACS) that is charged with administering charitable gaming regulations, including the issuing and renewing of licenses, on-site training, inspections, financial reviews, and compliance audits. OCRP staff issue licenses to organizations involved in charitable gaming, provide trainings to organizations on complying with charitable gaming requirements, conduct financial records reviews, and conduct on-site inspections of games and organizations. The OCRP employs approximately 25 full-time employees in three different units to administer charitable gaming: charitable programs (13 employees), auditing and financial reviews (five employees), and inspections (five employees). However, these 25 employees regulate other industries in addition to charitable gaming, including charitable solicitations, extended service contract providers, fantasy contests, home service contracts, health clubs, membership campgrounds, prepaid legal service plan sellers, and travel clubs.

OCRP is funded through a General Fund appropriation, which has been reduced in the past few years. In 2014, OCRP's appropriation was $1.47 million. By 2018, the appropriation had been reduced by 26 percent to $1.08 million.

OCRP collects fees from organizations and individuals participating in charitable gaming. The fee is 1.125 percent of all sales made by a licensed organization. Each organization conducting charitable gaming must also pay $200 for an annual permit (unless the organization is exempt under state statute). Additionally, any individual being paid to act as a bingo caller or bingo manager must register with OCRP and pay a $75 annual registration fee (volunteers and bingo callers at certain organizations such as volunteer fire departments are exempt from this registration fee). In FY 2018, OCRP collected $2.69 million in revenue from charitable organizations that was placed in the General Fund, with OCRP being allocated approximately $1 million from the General Fund to support its operations.

Horse racing wagering in the Commonwealth

Horse race wagering is permitted in the Commonwealth as a means of raising funds to support Virginia's native horse industry. Horse race wagering is governed by the Virginia Racing Commission (VRC). Horse race wagering uses a system of wagering called "pari-mutuel wagering" whereby participants bet on horses to finish in a certain place or places. Bets of the same type are pooled, deductions required or permitted by law are taken out, and winnings are distributed based on amounts wagered. Statute limits the types of wagering allowed to live wagering, simulcast wagering at off-track

betting (OTB) locations, advance deposit account wagering, and historical horse race wagering (Table F-4).

TABLE F-4
Types of horse race wagering permitted in the Commonwealth

Live race wagering	Placing a bet on a live horse race at the facility where the horse race is conducted.
Simulcast wagering at off-track betting locations	Placing a bet on a horse race at a pari-mutuel wagering facility that televises live horse races via simulcast.
Advance deposit account wagering	Establishing an account with an entity to place pari-mutuel wagers electronically. Wagers are made electronically (mobile or internet) or via phone.
Historical horse race wagering	Placing bets on previously conducted horse races through an electronic gaming device that randomly chooses races from a library of hundreds of thousands of previously run horse races.

SOURCE: Code of Virginia §59.1-365

Wagering on live horse racing was authorized in statute in 1988. A locality must pass a voter referendum authorizing pari-mutuel wagering in that locality for live racing or an off-track betting facility to be located there. Currently, at least eleven Virginia localities have passed a referendum and are authorized to host a race track or pari-mutuel site. In 2018, the Virginia General Assembly authorized historical horse racing (HHR) wagering in the Commonwealth. HHR machines are slot-like machines that allow players to wager, with the outcomes of the wagers being dictated by actual results from previously held horse races (for which identifying information is withheld from the player). HHR wagering is only authorized in localities that have passed a referendum allowing pari-mutuel wagering.

Following the authorization of HHR wagering, an investment group purchased Colonial Downs with the intention of offering HHR wagering at the track facility and at some satellite facilities throughout the state, and re-introducing live thoroughbred racing to Colonial Downs (live racing had ceased in 2014). In the first six months since the introduction of HHR terminals in the Commonwealth, wagering on the HHR terminals totaled over $714 million, generating over $57 million in net gaming revenue.

TABLE F-6
Horse race wagering locations in Virginia

Facility	Locality	Number of historical horse racing terminals
Live race wagering, simulcast wagering, and historical horse race wagering		
Colonial Downs	New Kent County	600
Simulcast wagering and historical horse race wagering		
Rosie's – Vinton	Roanoke County	150
Rosie's – Richmond	Richmond City	700
Rosie's – Hampton	Hampton City	700
Rosie's – Chesapeake	Chesapeake City	700
Simulcast wagering only (former VEA locations)[a]		
Breaker's	Henrico County	--
The Windmill	Henry County	--
Ponies and Pints	Richmond City	--
Buckets	Chesapeake City	--
Proposed locations – Simulcast wagering and historical horse race wagering [b]		
Rosie's – Dumfries	Prince William County	150
Rosie's - Danville	Danville City	150

SOURCE: Virginia Racing Commission and Peninsula Pacific Entertainment.
NOTE: [a] The Virginia Equine Alliance (VEA) opened four satellite off-track-betting facilities in 2016 and 2017. As part of the revenue-sharing agreement between the VEA and the new Colonial Downs owners, the ownership of these facilities is being transferred to Colonial Downs. [b] Under current law, 3,000 total historical horse racing (HHR) terminals are allowed in the Commonwealth. If the Colonial Downs eventually opens both the Dumfries and Danville locations (which were approved by local referendums in November 2019), they will need to reduce the number of terminals at one of their other locations to stay within the limit or the law will need to change to increase the number of terminals allowed in the state. Additionally, current law limits the number of licenses for pari-mutuel wagering to 10 facility licenses. If Colonial Downs eventually opens both the Dumfries and Danville locations, they will need to remove wagering from one of the existing locations or regulations will need to change.

Five HHR locations have opened or are planned (Table F-6). Colonial Downs reopened with 600 HHR terminals in April 2019. An HHR location opened in Vinton (Roanoke County) with 150 HHR terminals in May 2019. A third HHR location opened in Richmond with 700 HHR terminals in July 2019. The Colonial Downs owner plans to open a fourth HHR location in Hampton and fifth location in Chesapeake. These five locations and their number of gaming terminals were modeled by The Innovation Group as part of their analysis of gaming in Virginia.

In addition to these five locations, the Colonial Downs owner has also expressed interest in eventually opening HHR locations in Danville and Dumfries. A referendum was held in November 2019 and was approved by voters in both localities.

Virginia Racing Commission oversees horse racing and pari-mutuel wagering

Statute vests the Virginia Racing Commission (VRC) with the power to promulgate regulations relating to horse racing and pari-mutuel wagering, and it also vests the VRC with the control of horse racing. Statutes and regulations limit where horse race wagering can occur, who requires licensing to participate in the horse racing industry, how licensing is conducted, types of bets that may be made, how bets are taxed, how tax proceeds are distributed, and types of equipment that may be used.

The VRC consists of five members. The governor appoints all five members of the VRC and both chambers of the General Assembly must approve the appointments. Statute requires VRC members to have been a resident of the Commonwealth for at least the three years preceding their appointments, and they must maintain residency in the Commonwealth for the duration of their term. Statute also imposes several ethical requirements on VRC members including:

- prohibiting commission members and their immediate family members from having any direct or indirect financial interest in any horse racetrack, satellite facility, or any other entity regulated by the VRC;
- prohibiting commission members and their immediate family members from participating as an owner of a horse or a contestant in any race subject to the jurisdiction of the VRC; and
- prohibiting commission members and their immediate family members from making contributions to any candidate for office at the state or local level.

Statute vests the VRC with broad powers. The VRC is considered a supervisory board because it is responsible for agency operations and appoints the agency director. Statute also directs the VRC to encourage participation in horse racing.

VRC staff conduct day-to-day operations to ensure the integrity of horse racing and horse race wagering in the Commonwealth

VRC staff play several roles in ensuring the integrity of horse racing and horse race wagering in the Commonwealth. First, the staff provides assistance to commissioners in drafting and promulgating regulations related to horse racing and horse race wagering. Second, the staff licenses and permits all individuals participating in horse racing and horse race wagering in Virginia. This work has expanded with the General Assembly's authorization of HHR wagering in 2018. In addition to licensing all wagering facilities, the VRC staff must now license facilities with HHR terminals and ensure that those terminals meet regulatory requirements. Third, the staff monitors and ensures that horse races conducted in Virginia follow applicable rules and regulations. This includes operating a test barn at each race and randomly testing horses to ensure that illegal performance enhancing drugs were not used.

VRC's operations are funded from the proceeds of taxes that the Commonwealth imposes on pari-mutuel wagering. The 2018 Appropriations Act authorized the VRC to spend $3.2 million, but the agency spent only $1.8 million. Currently, VRC has three full-time employees, including the Executive Secretary, and three part-time employees. VRC recently added one part-time position for an HHR compliance specialist. VRC also employs another 25 staff on a seasonal basis (approximately 12 weeks per year) to assist in facilitating live racing events.

Appendix G: Problem gambling literature review

This appendix lists research reviewed for Chapter 5, related to the prevalence of problem gambling and potential negative impacts.

Summary of research on the impact of gambling access on personal bankruptcies			
Type of comparison	**Direction and Size of Effect**	**Key Result**	**Source**
Distance to slot machines, across neighborhoods in Alberta, Canada	Positive, moderate size	"[A] removal of 1% in total dollars gambled on slots causes a 1% reduction [in bankruptcies]. These effects are largest (between 2 and 3%) when neighbors are very close to the bar with slots removed (within a quarter kilometer), but decrease in size to below 1% when neighbors are slightly further away (within a half kilometer or within three quarters of a kilometer)."	Mikhed 2017
Years since establishing lotteries and casinos, across states	Positive, large effect prior to 1995, not after	"States that adopted lotteries and casinos prior to 1995 experienced significantly higher personal bankruptcy rates while the effect of lottery and casino adoption on personal bankruptcies has disappeared since that time."	Grote 2014
Dollars wagered in casinos and on lotteries, across 90 federal judicial districts	Positive, small effect	"[C]asino-type gambling increases bankruptcies by about 2%. Lottery gambling, while less potent per dollar of revenue generated, has about the same total effect."	Daraban 2011
Existence of a casino in a county, across U.S. counties	Positive, large effect	"The existence of a casino in a county increases the bankruptcy rate by more than 9% in the first year of operation. The percentage of additional bankruptcies then decreases through the third year after the casino opens. Bankruptcy rates in casino counties then slightly fall below that of non-casino counties during the fourth through seventh years after opening, increasing once again in the eighth year and thereafter. This cycle corresponds closely to the 6-year statute of limitations period applicable to Chapter 7 bankruptcies."	Goss 2009
Number of visits to resort casinos in NV, NJ, and MS	Positive, moderate effect	"[S]tates having more residents who visit out-of-state casino resorts have roughly 10% higher bankruptcy filing rates, on average."	Garrett 2008
Casino and horse-racing proximity across Kentucky counties	Positive for horse racing, moderate size	"The results indicate that gambling at horse tracks has influenced bankruptcies, whereas casino gambling has not. It is estimated that counties within 25 miles of a horse track experience an 9.25% higher rate of bankruptcies."	Boardman 2007
Distance to pari-mutuel facilities and casinos across counties in IL, IA, and MO	No evidence of an effect	"Access to pari-mutuel or casino gaming facilities was found not to have a significant impact on personal bankruptcies."	Thalheimer 2004
Casino proximity across U.S. counties	Positive, moderate size	"The analysis predicts over a 5% decline in [bankruptcy] filing rates for counties surrounding a casino … if one were to eliminate casino gambling."	Barron 2002

Summary of research on the impact of gambling access on personal bankruptcies			
Type of comparison	**Direction and Size of Effect**	**Key Result**	**Source**
Casino proximity across U.S. counties	No evidence of an effect	"The evidence reported here does not support the hypothesis that the introduction of gambling has impacted county bankruptcy rates."	De la Vina 2002
Eight communities with recently adopted casino gambling compared to matched communities without gambling	Positive, moderate size	"[C]asino gambling is associated with an increase in personal bankruptcy in seven of the eight communities."	Nichols 2000

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Summary of research on the impact of gambling on mental health and family outcomes			
Type of comparison	**Size of Effect**	**Key Result**	**Source**
Age of onset of gambling and problem gambling compared to other disorders in a longitudinal sample (Sweden)	Not applicable because no comparison group for age-of-onset analysis	The authors find that male problem gamblers began gambling before the onset of other disorders, and problem gambling preceded depression and suicidal events. On the other hand, for females problem gambling was the last disorder to occur.	Sundkvist and Rosendahl 2019
Proportion of individuals with specific harms by gambling category: non-problem, low-risk, moderate risk, and problem gamblers (Australia)	Moderate adverse effects	The authors find consistent increases in adverse effects as problem gambling severity increases, for a large number of specific harms related to financial, work, health, and emotional/psychological harms.	Li et al. 2017
Incidence of mood, anxiety, and substance-use disorders among individuals with mild, moderate, and severe gambling disorders compared to non-gamblers, three years after assessment for problem gambling. (U.S.)	Moderate adverse effects	"Three years after the initial intake interview, compared to the non-gamblers, those reporting any gambling behavior at baseline were at increased risk to have any mood, anxiety, or substance use disorders…Similar graded relationships were found for a number of specific disorders."	Parhami et al. 2014
Incidence of mood, anxiety, and substance-use disorders among problem gamblers compared to non-gamblers, before and after onset of problem gambling. (U.S.)	Moderate adverse effects	"[Problem gambling] predicted the subsequent onset of generalized anxiety disorder, post-traumatic stress disorder (PTSD) and substance dependence." The authors also found that a variety of mood, anxiety, and substance use disorders predicted problem gambling.	Kessler et al. 2008
Suicide ideation and attempts			
Incidence of suicidal ideation and suicidal attempts in problem gamblers compared to non-problem gamblers (England)	Moderate adverse effects	The incidence of suicidal ideation and suicide attempts was higher for problem gamblers than for non-problem gamblers, even after controlling for differences in impairment, poor mental health, substance abuse, indebtedness, and homelessness.	Wardle et al. 2019

Summary of research on the impact of gambling on mental health and family outcomes			
Type of comparison	**Size of Effect**	**Key Result**	**Source**
Standardized mortality rates and suicide for individuals with gambling disorder compared to the general adult population, controlling for comorbidities (Sweden)	Large adverse effects	"SMR calculations showed a 1.8-fold increase in mortality for individuals 20–74 years old with GD compared to the general population, and a 15-fold increase in suicide mortality."	Karlsson and Hakansson 2018
Incidence of suicidal events among pathological gamblers compared by severity of gambling disorder, amount of money lost due to gambling, and types of gambling (Germany)	Moderate adverse effects	"Our findings suggest that gambling on electronic gambling machines … is associated with suicidal events in pathological gamblers independent of comorbidity."	Bischof 2016
Incidence of suicide ideation and attempts in pathological gamblers compared to non-gamblers (Iowa)	Moderate adverse effects	Suicide ideation and attempts were higher for pathological gamblers, and risk increased with severity of the gambling disorder.	Black et al. 2015
Rates of suicide ideation and suicide attempts among adults in five groups: pathological gamblers, problem gamblers, at-risk gamblers, low-risk gamblers, and non-gamblers (U.S.)	Moderate adverse effects	Rates of suicide ideation and suicide attempts increased with the severity of gambling problems	Moghaddam et al. 2015

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Summary of research on the impact of gambling on family outcomes			
Type of comparison	**Size of Effect**	**Key Result**	**Source**
Incidence of intimate partner violence (perpetration and victimization) for problem gamblers compared to non-problem gamblers, representative sample of adults (U.S.)	No evidence of an effect	The authors find higher rates of intimate partner violence among problem gamblers for both males and females but, after controlling for other disorder (mood, anxiety, drug, and alcohol), the differences were not statistically significant.	Roberts et al. 2019
129 treatment-seeking problem gamblers who perpetrated or were victims of family violence or intimate partner violence were asked which came first, gambling or violence (Australia)	Not applicable because no comparison group	"For the clear majority who reported that [gambling and violence] were related, it was more likely that gambling preceded violence and that the conflict that led to violence was about gambling: financial losses, or anger, stress and anxiety related to the losses."	Suomi 2019 et al.
Incidence of family violence for moderate risk and problem gamblers, and low-risk gamblers, compared to non-gamblers (Australia)	Large adverse effects	"In this population-representative sample, moderate risk/problem gamblers had over a twofold increase in the odds of experiencing both family violence victimization (21.3%) and perpetration (19.7%) relative to non-problem gamblers…"	Dowling et al. 2018
Family outcomes (current and change over time) for households with a moderate risk or problem gambler compared to households with no moderate risk or problem gamblers (Ontario, Canada)	Small adverse effects	"[A]nnual measures of moderate risk/problem gambling predicted time-specific decreases in family and interpersonal adjustment when measured concurrently, and lower family functioning and social support at subsequent waves."	Cowlishaw et al. 2016
Incidence of domestic violence in neighborhoods with higher density of electronic gaming machines (EGMs) compared to neighborhoods with lower density of (or no) EGMs (Australia)	Moderate adverse effects	"Postcodes with no electronic gaming machines were associated with 20% … fewer family incidents per 10,000 and 30% … fewer domestic-violence assaults per 10,000, when compared with postcodes with 75 electronic gaming machine per 10,000."	Markham et al. 2016
Incidence of perpetrating intimate partner violence for male problem and pathological gamblers compared to male non-gamblers (UK)	Moderate adverse effects	"Among men in the United Kingdom, self-reports of problem/pathological gambling remain predictive of a range of measures of violent behaviour after adjusting for alcohol and drug dependence, comorbid mental disorder and impulsivity…"	Roberts et al. 2016

Summary of research on the impact of gambling on family outcomes			
Type of comparison	**Size of Effect**	**Key Result**	**Source**
Incidence of domestic violence and child maltreatment among problem gamblers and pathological gamblers compared to non-problem gamblers (U.S.)	Moderate adverse effects	"[P]roblem gambling was associated with increased odds of the perpetration of dating violence … while pathological gambling was associated with increased odds of the perpetration of dating violence …, severe marital violence…, and severe child abuse ..."	Afifi et al. 2010

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Summary of research on the impact of gambling access on crime			
Type of comparison	**Direction and Size of Effect**	**Key Result**	**Source**
Number of crimes in surrounding localities before and after opening of the Plainridge Park, Massachusetts casino	No evidence of an effect	"Plainridge Park opened at the end of June 2015. Since that time, it has reported a number of crimes and calls for service commensurate with facilities of similar size and number of visitors. As for the surrounding community (including six towns), the totality of the evidence shows little impact on most crimes and calls for service."	Bruce 2018
Crime in Illinois census blocks w video gambling compared to census blocks without video gambling, before and after video gambling was established	Positive, moderate	"We find that (i) access to gambling increases property and violent crimes; (ii) these are new crimes rather than displaced incidents; and (iii) the effects seem to be persistent over time…"	Bottan et al. 2017
Crime in a Philadelphia neighborhood before and after a casino opened	No evidence of an effect	"[T]he current study is unable to identify a neighborhood level effect of the casino on crime."	Johnson and Ratcliffe 2017
Crime in U.S. counties with casinos, before and after casinos opened compared to U.S. counties with no casinos	Positive, moderate	"The results from this study suggest that casinos are associated with increases in crime but these effects appear transitory."	Nichols and Tosun 2017
Crime in Michigan counties near a casino compared to Michigan counties farther from a casino	No evidence of an effect	"Our results suggest that in most cases the property crime rates studied are not affected by the presence or size of a casino in a county or in a nearby county."	Falls and Thompson 2014
Crime rates before and after introduction of casinos and video lottery terminals in 78 communities in Alberta, Canada	Positive and negative effects, small	"Estimates … indicate little association between gambling and crime. However, some positive and negative crime-specific effects are found for both casinos and VLTs."	Humphreys and Soebbing 2014
Crime rates in 200 localities in Victoria, Australia compared to electronic gaming machine expenditures per capita	Positive, moderate	"[O]ur results indicate a consistent positive and significant relationship between gaming and crime rates, especially income-generating crime rates, at the local level."	Wheeler et al. 2011

Summary of research on the impact of gambling access on crime			
Type of comparison	**Direction and Size of Effect**	**Key Result**	**Source**
Crime rates on 70 college campuses in the Midwest within 10 miles of a casino compared to 103 campuses not within 10 miles of a casino	Positive, moderate	"Analysis of reported crime data for 173 residential colleges and universities in four Midwestern states suggests that robberies and motor vehicle thefts, but not burglaries, are significantly higher in number for campuses located within 10 miles of a casino."	Hyclak 2011
Crime in Indiana counties with casinos, before and after casinos opened compared to Indiana counties with no casinos	Mixed effects, small	"I find very limited support for the proposition that new casinos increase local crime rates."	Reece 2010
Crime in casino counties compared to non-casino counties, before and after casino opening, all U.S. counties	Positive, moderate	"Most factors that reduce crime occur before or shortly after a casino opens, whereas those that increase crime, including problem and pathological gambling, occur over time. The results suggest that the effect on crime is low shortly after a casino opens, and grows over time. Roughly 8% of crime in casino counties in 1996 was attributable to casinos, costing the average adult $75 per year."	Grinols and Mustard 2006

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Summary of research on the prevalence of problem gambling				
Geographic area, time period, and instrument	**Measure**	**Estimate of problem gambling prevalence**	**Key Result**	**Source**
Summary of 202 studies conducted worldwide, 1975-2012	Past-year prevalence	2.3%	"Depending on the specific country and the survey year, the standardized past year rate of problem gambling ranges from 0.5% to 7.6%, with the average rate across all countries being 2.3%."	Williams et al. 2012
Maryland 2017, NODS	Past-year prevalence	1.9%	"The survey found 0.7% of adults over the age of 18 were problem gamblers, and 1.2% were pathological gamblers. When combined, the prevalence of disordered gambling (problem and pathological) was 1.9%. This prevalence estimate was lower than the prevalence of 3.4% noted in 2010. However, we believe the 2017 prevalence is likely an underestimate of true prevalence of DG [disordered gambling].	Tracy, et al. 2018
Ohio, 2016-2017, CPGI	Past-year prevalence	0.9%	6.4% low risk gambler, 3.0% moderate risk, 0.9% problem gambler. Combining these groups gives an at-risk population of 10.3%, close to double the 5.7% at-risk rate in the 2012 baseline survey, prior to the opening of the state's casinos and racinos.	Ohio for Responsible Gambling 2017
Louisiana 2016, SOGS	Past-year prevalence	8.3%	"The 2016 statewide prevalence rate of potential problem gamblers is estimated to be 5.4% [SOGs=3-4], while the statewide prevalence rate of pathological gamblers is estimated at 2.9% [SOGs=5+]. Both exceed the 2008 rates of 1.7% and 1.4% reported respectively."	Biggar et al. 2017
Oregon 2015, PGSI, 26% response rate	Past-year prevalence	1.1% to 2.6%, depending on cutoff	The authors used a higher cut-off score to identify problem gambling than used in prior studies.	Moore and Volberg 2016
Iowa 2015, PGSI, 27% response rate	Past-year prevalence	1.2%	"[T]he estimation of at-risk gamblers in 2015 is about 13%... About one in four adult Iowans (23%) know a person whose gambling may be causing problems for him/her. In addition, about one in seven adult Iowans (15%) said that they have been negatively affected by others' gambling behaviors."	Park and Losch 2016

Summary of research on the prevalence of problem gambling				
Geographic area, time period, and instrument	**Measure**	**Estimate of problem gambling prevalence**	**Key Result**	**Source**
Massachusetts, 2013-2014, PPGM, 37% response rate	Past-year prevalence	2.0%	"The current prevalence of problem gambling in Massachusetts is 2.0% of the adult population. An additional 8.4% of the population are at-risk gamblers." The estimate is prior to the opening of casinos in the state.	Volberg et al. 2017
U.S. nationwide, 2011-2013, SOGS and DSM-IV, 58% response rate	Past-year prevalence	4.6% (DSM-IV), 5.0% (SOGS)	Compared to a similar survey conducted in 2000, "rates of pathological and problem gambling remained stable during the decade of the 2000s. This occurred even though there was a general expansion of legal gambling and liberalization of gambling laws in the US during this time." The authors used a lower cutoff than most studies to define problem gambling.	Welte et al. 2015
North America, systematic literature review; 3 studies, 2002, 2005, 20015	Past-year prevalence	2% to 5%	"[I]n North America the past-year problem gambling prevalence rates ranged from 2% to 5%." [based on 3 studies]	Calado & Griffiths 2016
Great Britain, 2016, PGSI	Past-year prevalence	1.6%	"Overall, 2.4% of adults were classified as low risk gamblers (a PGSI score of 1 or 2) and a further 1.1% as moderate risk gamblers (a PGSI score of 3 to 7)…[P]roblem gambling prevalence was 0.5%.."	Conolly et al. 2018
Canada (4 provinces), 2013-14, PGSI, 87% response rate	Past-year prevalence	0.82%	"Increased exposure to casinos is found to be related to increases in both participation and problem gambling risk, despite the observation that all four provinces recently experienced casino expansion and population-wide declines in problem gambling prevalence rates."	Philander 2019
New Zealand, 2012, longitudinal, 64% response rate, SOGS	Lifetime prevalence	4.5%	"In 2012, it was estimated that there were 2.1% lifetime probable pathological and 2.4% problem gamblers."	Abbott 2017

Summary of research on the prevalence of problem gambling				
Geographic area, time period, and instrument	**Measure**	**Estimate of problem gambling prevalence**	**Key Result**	**Source**
Finland, 2011-2012, PGSI, 40% response rate	Past-year prevalence	1.2%	During the previous year, 13% of respondents experienced at least one gambling-related harm. The four commonest harms were 'chasing losses' (8.6%), 'escalating gambling to maintain excitement' (3.1%), 'betting more than could afford to lose' (2.8%), and 'feeling guilty' (2.6%).	Raisamo et al. 2015
Sweden, longitudinal, 2009-2010, 55% response rate, PGSI & SOGS	Past-year prevalence	2.2%	"The SOGS current prevalence rate for pathological (0.9%) and problem gamblers (1.3%) was 2.1% of adults. The current rates for the PGSI instrument were similar to SOGS for problem gamblers and moderate risk combined (2.2%). The SOGS lifetime prevalence rates were about double the current rates." "[S]ubstantially more people experience gambling-related problems than is evident during a particular 12-month period, and that 'lifetime' measures assess this only partially. Problem gamblers are also prone to relapse."	Abbott et al. 2018
Europe, summary of 28 prevalence studies in 14 countries 1997-2010, 55% average response rate	Past-year prevalence	1.6% average	The authors found little evidence of an association between gambling policies and prevalence rates, with one exception: restrictions on advertising for online gambling were associated with lower prevalence rates.	Planzer et al. 2014

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